VOL. 42 CLEVELAND DECEMBER, 1912 NEW YORK No. 12

Self-Discharging Collier

Steamer Herman Sauber, Constructed With Belt Conveyor for Unloading

By Frederick C. Coleman

A NEW system of belt-conveyor discharge has been installed by William Doxford & Sons, Ltd., in a new vessel, the steamship Herman Sauber, which they have recently built at the Pallion ship yard, Sunderland, Eng., to the order of Sauber Bros., of Hamburg. This vessel has a length between perpendiculars of 315 ft., and a carrying capacity of 3,750 tons on a draught of 18 ft. 9¼ in., and at a service speed of 10 knots. The machinery, comprising triple-expansion engines and forced draft boilers, is placed aft and provides space for the incline of conveyors, which, at one operation, convey the cargo from the holds and elevate it into the stern of the vessel.

The Herman Sauber is built on the single-deck system, with long poop and topgallant forecastle and subdivisions in holds as may be necessary for trade intended, or with one clear hold continuous from machinery compartment to fore peak. The framing of the vessel is all vertical, not only on the sides of the vessel but also on the bulkheads, and no longitudinal stringers are fitted, nor any horizontal interruption to the gravitation of the cargo to the conveyors. Compensation stringers are fitted at the breaks with inclined covering plates and a free flow of all cargo is insured.

The bilges of the vessel are occupied by large enclosed ballast spaces which join onto the double bottom ballast spaces and together provide a total ballast and bunker condition of almost half loaded; and they provide a double skin to the vessel, rising to within a short distance of the load line, forming an ample provision against damage and fully compensating for the absence of the ordinary athwartship bulkheads in holds. The vessel is also provided with transverse watertight bulkheads enclosing the machinery space, the after peak and also the fore peak spaces.

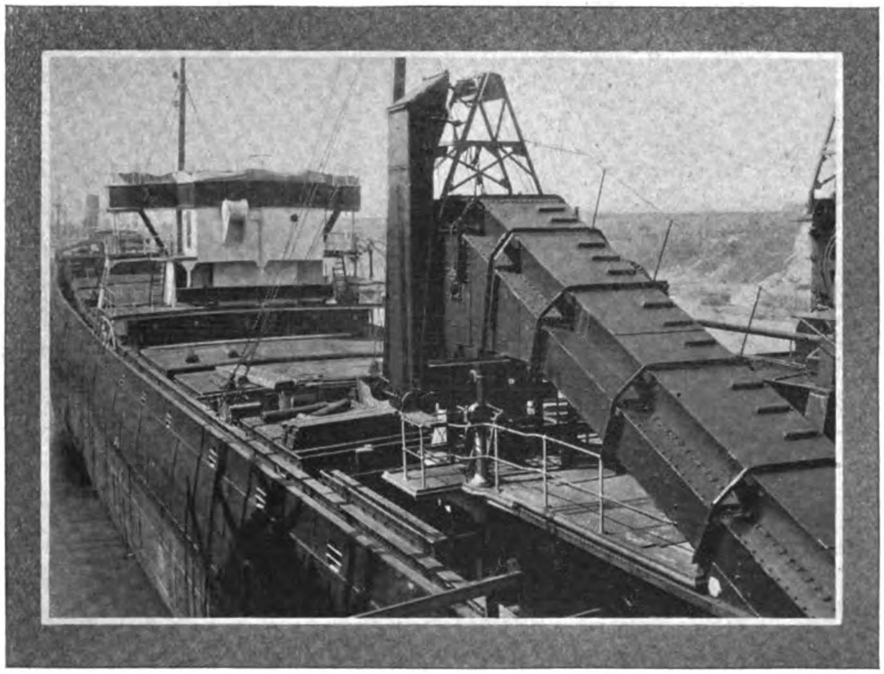
Great Breadth of Hatchways

The self-trimming hatchways for loading are of great breadth, extending to about 4 ft. from each side of the vessel and are practically continuous fore and aft, being only broken at intervals for free access for fitting tarpaulin covers and for the necessary space for navigation and cabin accommodation. They are constructed with 32-in. coamings, portable girders and covers and provision for battening down. The portable girders are fitted in a special manner, lying fore and aft, and have appliances supplied so that two men can easily move them by hand to clear the hatch of all obstructions when such is desired, and in no case do they need winch power to assist them.

Cabin accommodation is provided on deck in roomy houses for captain, officers and engineers, and in topgallant forecastle for crew, and near machinery casing on poop deck for firemen, together with liberal provision for bathing and all sanitary appliances. The center portions of the bottom of the holds between the bilge ballast tanks is fitted with an inclined top tunnel giving free access to both conveyors, which are situated on both sides of the vessel, and together with the inclined bilges gravitate all the cargo to the feeding doors to the conveyors.

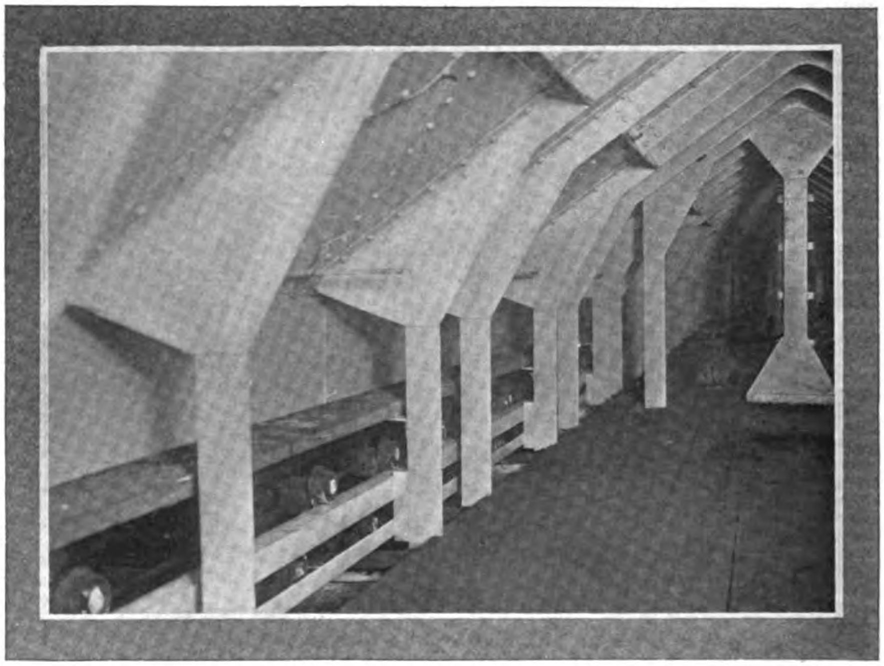
The slow speed conveyors, two in number, are on either side of the hold. They are constructed on the Doxford patent system of continuous steel rope drive, with steel blocks fitted at intervals by a specially devised methód. These blocks engage with the driving gear and also carry the compressed steel trays which are also specially designed and travel on continuous angle guides, traversing the whole length under the holds. These conveyors rise at a proper incline through the machinery space

and deliver the cargo in the stern of the vessel, where it is received onto a second pair of conveyors and conveyed forward, and at the same time elevated to a suitable point of discharge. In cases where it is intended to deliver on wharf a shore gear can be ecanomically arranged to receive the cargo direct from the first conveyors in the stern and reduce the capital cost of the vessel.



COLLIER HERMAN SAUBER, LOOKING FORWARD

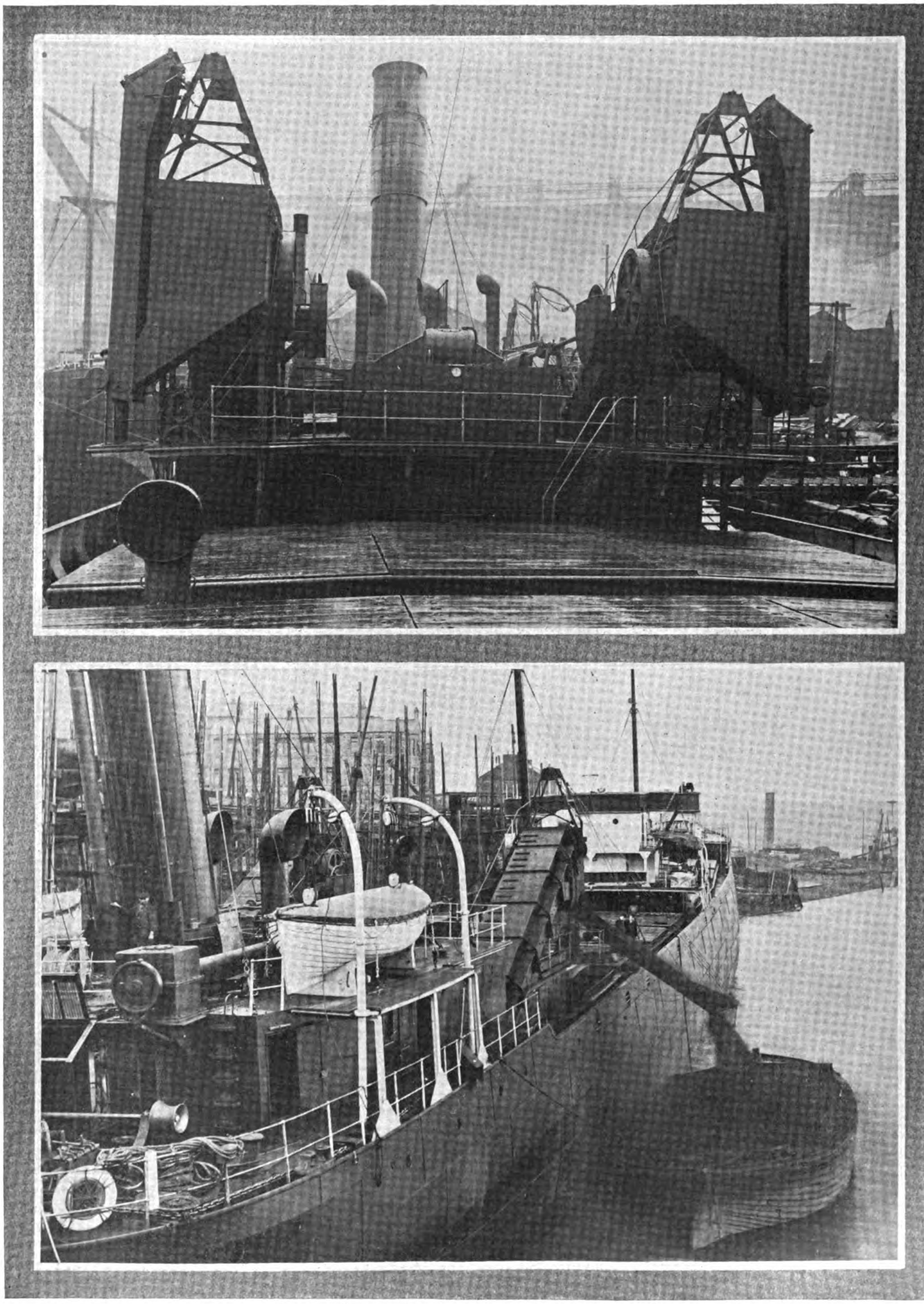
The feeding arrangement for the cargo to the conveyors is by means of drop feed doors spaced at regular intervals along the hold, the spaces between the doors being occupied by V-shaped hoods, which give access to each door from the tunnel, and together with the transverse incline of the tunnel and tanks form an automatic feed. These doors are fastened in position by an ordinary locking bar with preventor pins and are opened by the operator in the tunnel one after another, but in no case is more than one door to be opened at one time on either side of the vessel. The operator, after withdrawing the locking bar, stands by and in case of ordinary cargoes has nothing further to do beyond closing the door when the run has ceased and then opening the next. In vessels of this design intended to carry large Welsh coal a special slide door would be fitted in each hood to supplement the aperture of the drop door. This slide door is only used as a means of relieving stoppages—not as a permanent increase. In case of large Scotch, Yorkshire or Welsh coal, he may from time to time require to release a partial stoppage, which, however, is easily done by means of hook or pinch bar provided for that purpose. In case of large Welsh coal, two operators will, however, be required for each conveyor in the tunnel, as freeing stoppages by the slide door in this large coal will occasionally have to be supplemented by a hook or pinch bar and the attendance is more continuous.



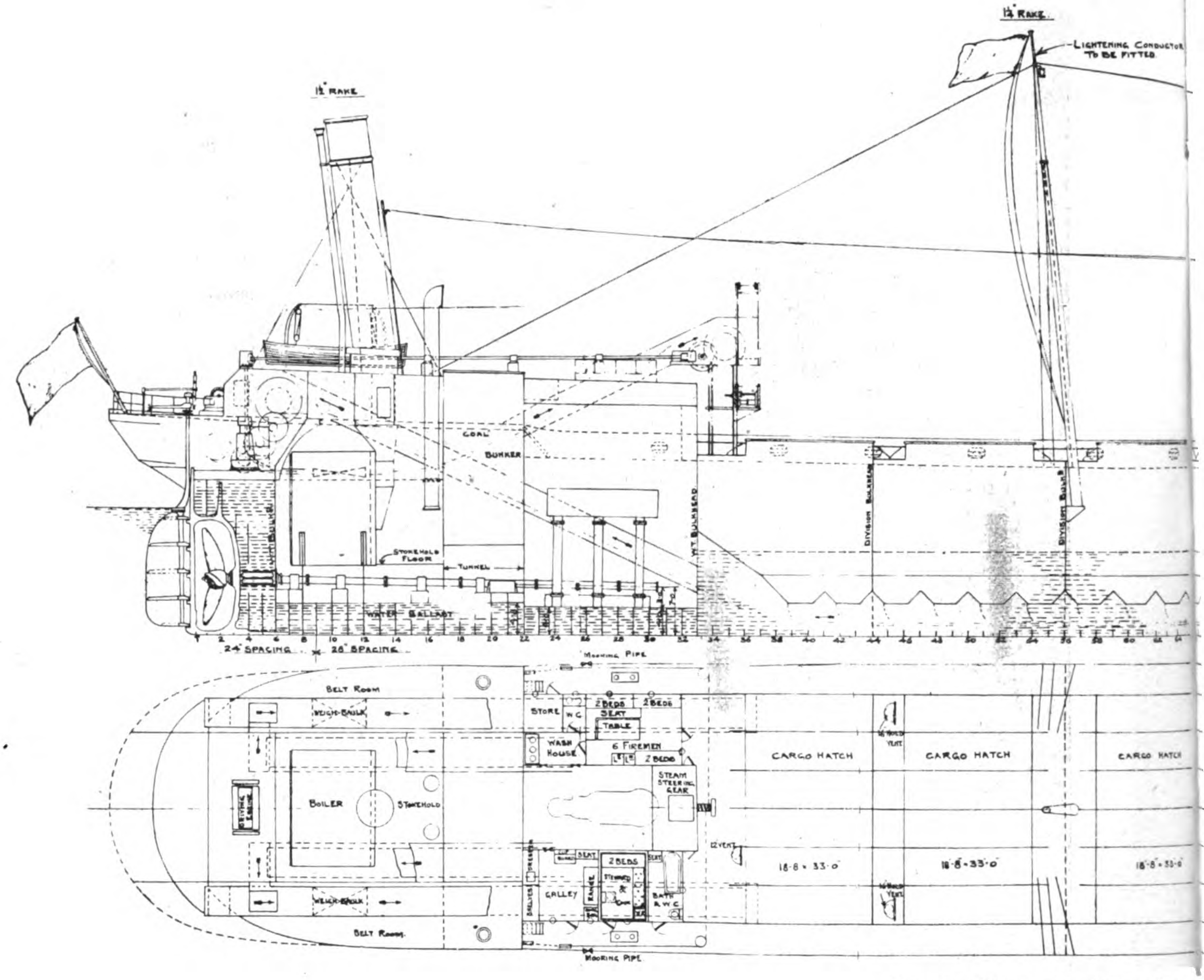
CARGO HOLD OF STEAMER HERMAN SAUBER

One feed door gives a discharge of 200 to 400 tons per hour, allowing for stoppages for moving barges or train, varying only with the class of coal, small coal giving the larger quantity. And as the vessel discharges on both sides with two conveyors the cargo is delivered at 400 to 800 tons per hour. Direct communication is provided between the deck and tunnel by electric bell and voice tube, and between the deck and engine room by telephone.

The driving gear for the conveyors consists of a compound surface condensing high-pressure engine, driven from main boilers and connected to the conveyors by gearing, giving a speed of conveyor of 80 ft. per minute. The gear is driven through Edmiston clutches which instantaneously stop and start the conveyor on either side of the vessel with its full load. This enables the officer in charge on either side of the deck to have the loading of a barge or truck instantly stopped for moving the receiving vessel and instantly started again by communicating by means of the usual telegraph installation. Delivery shoots are fitted on both sides and operated by hand winches for lifting and lowering to suit the height of vessel alongside and have a controlling door on the end of the shoot operated from the deck by the same operator, so that the load is further manipulated according to the breadth of the barge and the rush of the coal is restrained and breakage avoided. The vessel is fitted throughout with complete installation of electric light, including liberal lighting of tunnel and a lamp in each hood for the operator. Ventilation of the tunnel space is provided by electric fan, fitted in the deck house, delivering a large volume



Two Graphic Views of the Collier Herman Sauber



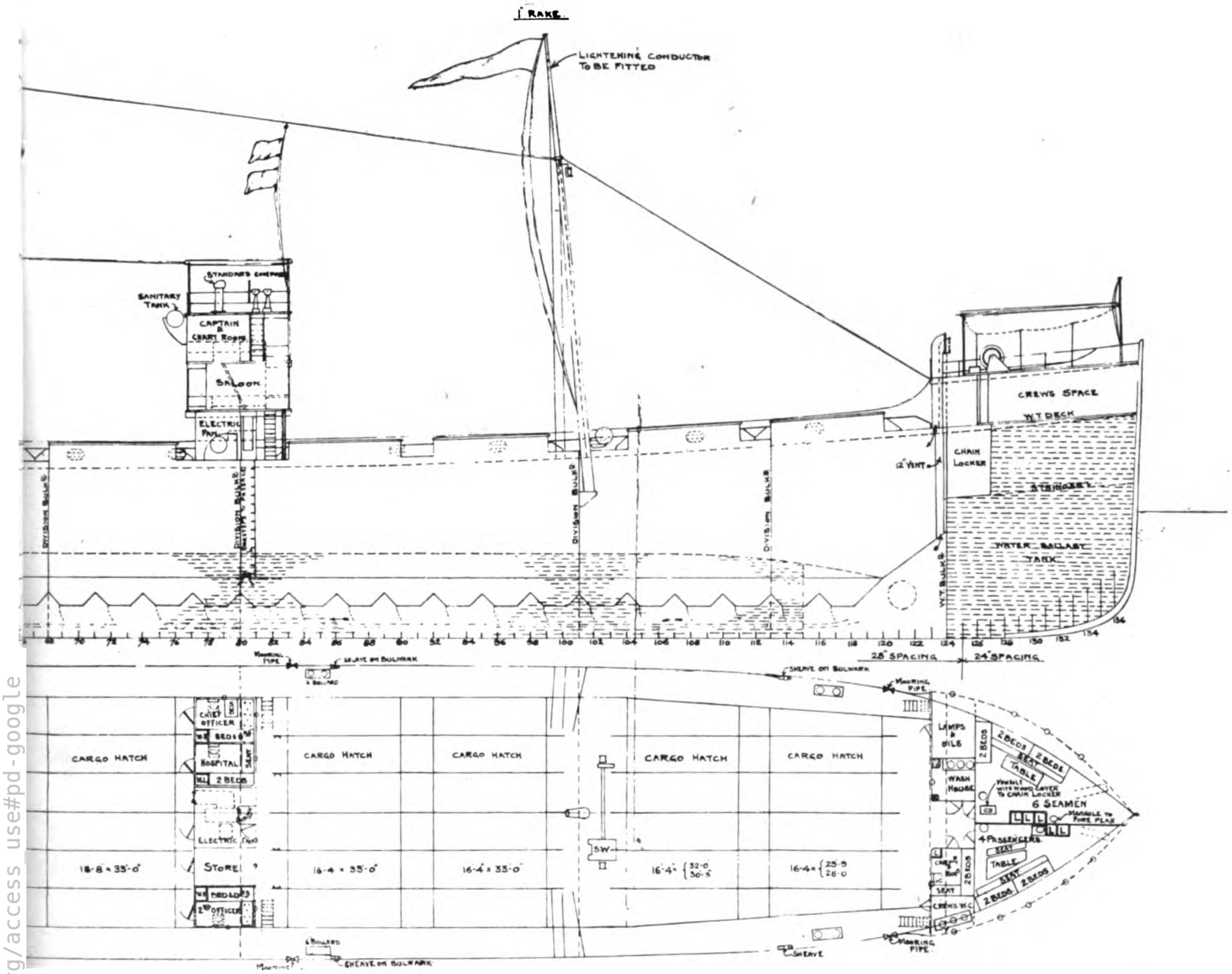
INBOARD PROFILE AND DECK PLAN

of fresh air into the tunnel, which in addition to providing fresh air drives gas and dust back into the holds and keeps the tunnel free. The inlet ventilator truck also forms an entrance from the deck to the tunnel, being fitted amidships. The tunnel is also provided with an outlet ventilator at both ends and entrance through watertight doors from machinery space. The holds are ventilated by ventilators on deck. The staff required to work the discharge of the vessel is: A fireman for the boiler, an engineer for driving engine, a greaser, two laborers in the tunnel to open doors, two spare laborers on deck to attend to clearing up holds after cargo has run out, the tunnel operators then re-opening the doors if any coal is reported left in hold.

The cost of discharge (coal, oil and labor) is less than a farthing per ton. The whole gear, being of substantial construction, with very few working parts and of slow speed, it is believed that the upkeep will not exceed the ordinary expenditure on the usual winch outfit, and a considerable saving will be found as against derricks, falls, blocks, guys, etc. Shore labor is practically dispensed with, and the vessel is freed from the risks of labor stoppages to this extent. This also enables the vessel on occasions to run the cargo out instead of being delayed by weather conditions, under which the ordinary big shore gang will not work. Where a proper supply of receiving barges is arranged, the Herman Sauber can complete discharging in six hours for any coal except large Welsh, which may take nine to ten hours. The use of this gear reduces the breakage of coal, as handling is minimized. When the delivery shoots on deck are provided with covers, there is an absence of dust, excepting only that from the barges where the coal is delivering; the transportation of the whole of the coal being under cover.

Statistics of Internal Commerce

If proposals recently suggested are worked out, the railroads will within a year or more be reporting the kinds and volume of commerce carried over their lines, as will also the steamship companies, to the Interstate Commerce Commission, in addition to the present financial statement that is monthly and yearly. This plan has arisen incident to the proposal of the reorganized Bureau of Domestic and Foreign Commerce in the Department of Commerce and Labor to eliminate hereafter the statistics on internal commerce. This bureau is not collecting the statistics this year, owing to the failure of congress to allow an appropriation. The figures were very valuable to the Interstate Com-



OF THE STEAMER HERMAN SAUBER

merce Commission and have frequently been used by the commission in estimating costs of service. It has been suggested that the commission itself arrange to collect this data in the future. It is believed that under the law the railroads and steamship lines could be required to make reports on the kinds and volume of commerce handled by them to the Interstate Commerce Commission.

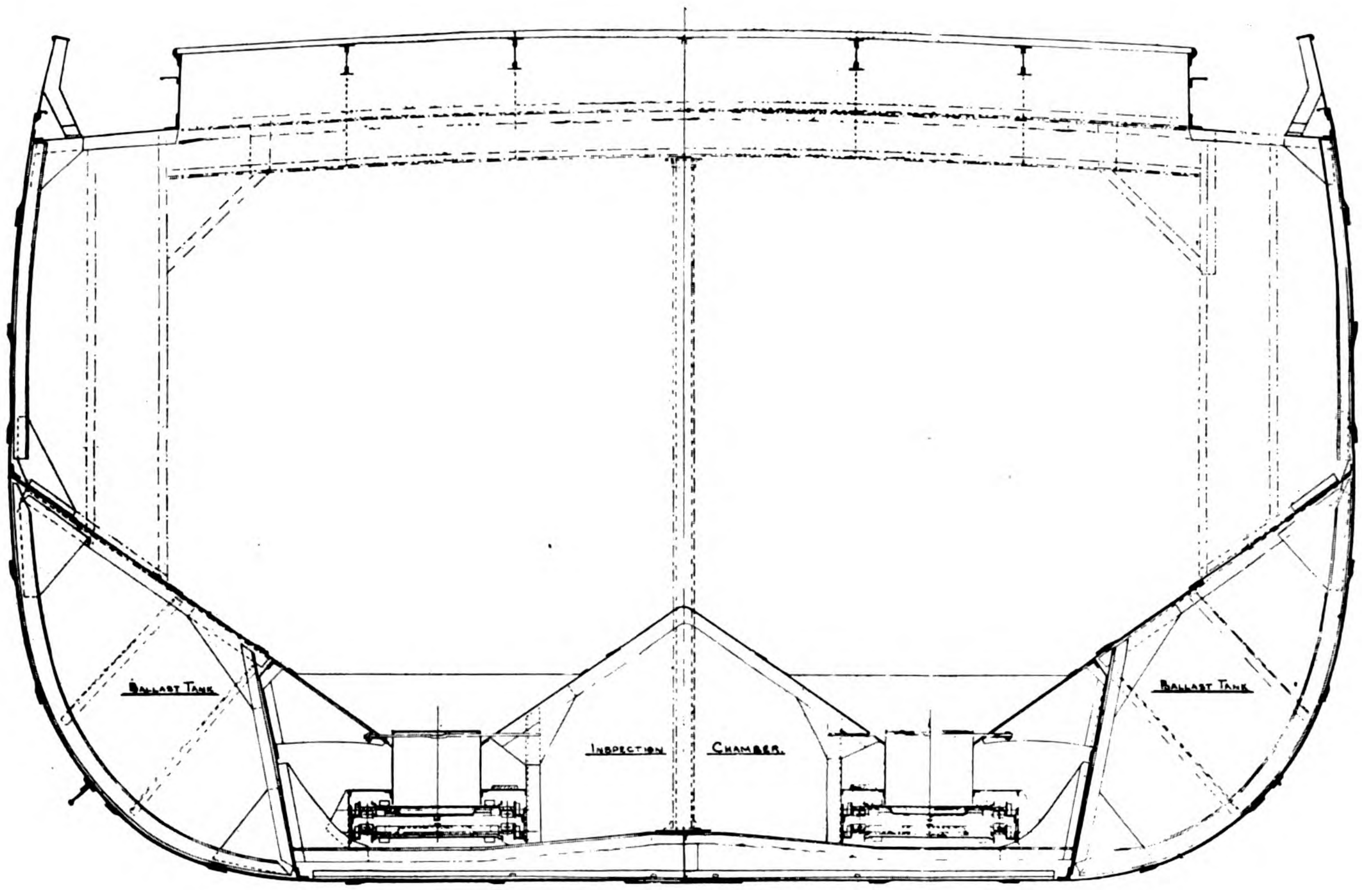
These traffic reports are very valuable and it is regrettable that they should have gone so long uncollected. The Bureau of Statistics a few years ago took up the work of collecting the statistics of water-borne commerce, but as the giving of the information was not mandatory the statistics were obviously incomplete and some of the lines failed to furnish the information. There is no good reason why the information should not be forthcoming, and there are many why it should. It affords a very reliable index of the general growth of industry. If the power of the Interstate Commerce Commission to collect this data is not ample, it should be made so.

Hopper Steamer for Fleetwood

Messrs. Wm. Simons & Co., Ltd., Renfrew, launched the Preesall, a twin-screw hopper steamer constructed to the order of the Lancashire & Yorkshire & London & North Western Joint railways for Fleetwood harbor. In accordance with the builders' well-known practice the vessel was launched complete with steam up ready for work. The Preesall is propelled by two sets of triple-expansion surface condensing engines and two multitubular high pressure steel boilers, easily capable of supplying engines with steam for a speed of 9 knots per hour. All the most modern auxiliaries are provided in the engine room, including steam and hydraulic reversing gear, independent pumps, etc. A steam windlass is fitted forward and a steam capstan aft for warping purposes. The hopper for carrying the spoil is divided into compartments and the discharge doors are controlled by steam appliances designed so that each compartment may be emptied independently of the others or that all the compartments may be discharged at the same time. Roomy and well ventilated cabins are provided for the accommodation of the officers and crew.

The construction of the vessel, which is classed 100 A-1 at Lloyds, was carried out under the direction of Geo. Hughes, chief mechanical engineer to the company, and W. Johnson, superintending engineer of the company's engineering works at Fleetwood, assisted by D. Heggie, resident inspector.

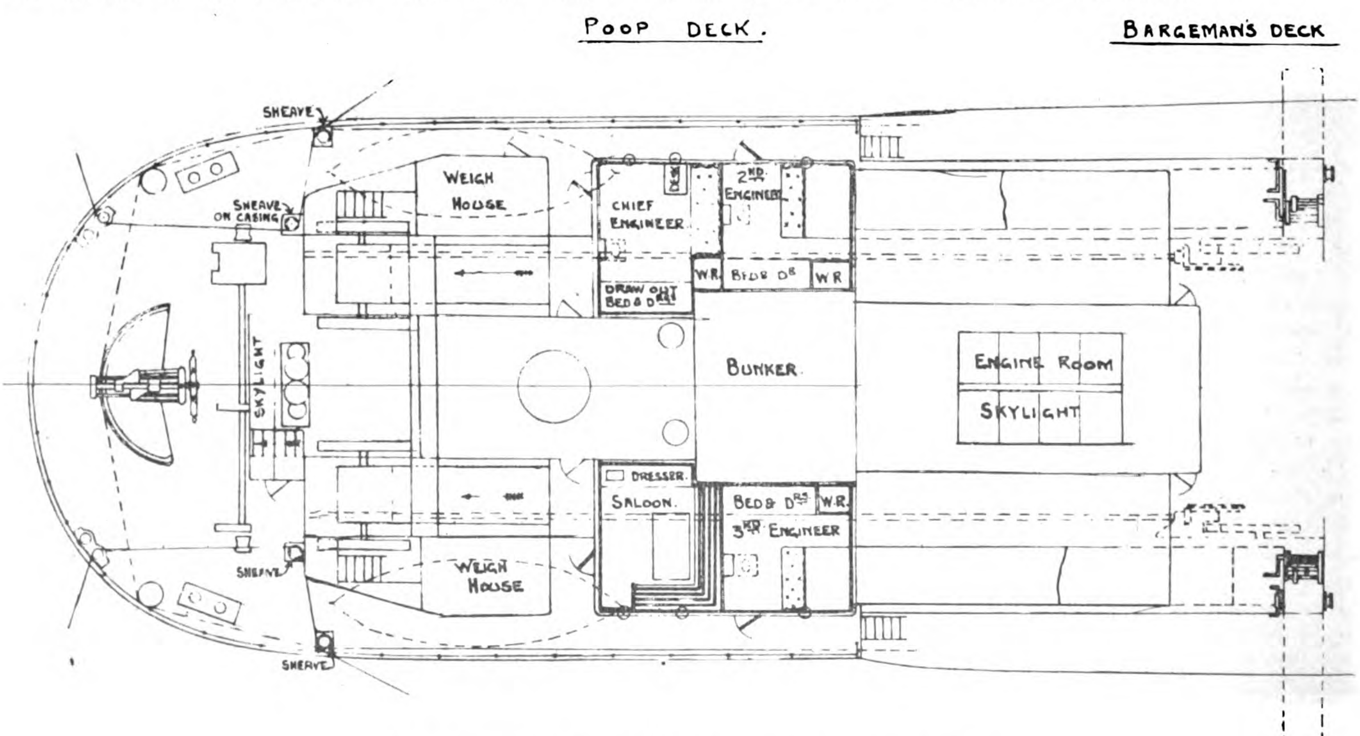
Lake shipbuilders have been asked for bids for lengthening the steamer Empress of Midland, 72 ft.



Midship Section of the Steamer Herman Sauber

Depth of the Ocean

Where are the deepest depths of ocean? The record is held for the present by a spot which lies 40 nautical miles east of Northern Mindanao, one of the Philippine Islands. The German survey ship Planet, taking soundings under conditions which permit the fullest confidence in the accuracy of the result, found there a depth of 9,780 metres or 5,348 fathoms. The greatest depth previously known was that found by the American ship Nero, near Guam, in 1899, which was 5,268 fathoms. The German surveyors have managed to determine the bottom temperature, and also to secure a specimen of the sea bottom from its bed more than six miles below the surface.



Poop and Bargeman's Deck, Steamer Herman Sauber

Dominion Steamer Estevan

Description of a Lake-Built Vessel Intended for Service on the Pacific Coast

THE Collingwood Ship Building Co., Collingwood, Ont., have just completed the twin-screw steamer Estevan to the order of the Dominion government's department of marine and fisheries, and is specially designed to handle the lighthouse and buoy service on the Pacific coast.

The vessel has a handsome appearance and is fitted up in the latest and most expensive style. Her principal dimensions are 200 ft. between perpendiculars, 38 ft. molded beam and 17 ft. 6 in. depth molded to main deck, the superstructure consisting of a top gallant forecastle, and a combined poop and bridge. Over the bridge a boat deck is fitted for the accommodation of boats, wheelhouse, wireless telegraph room, etc.

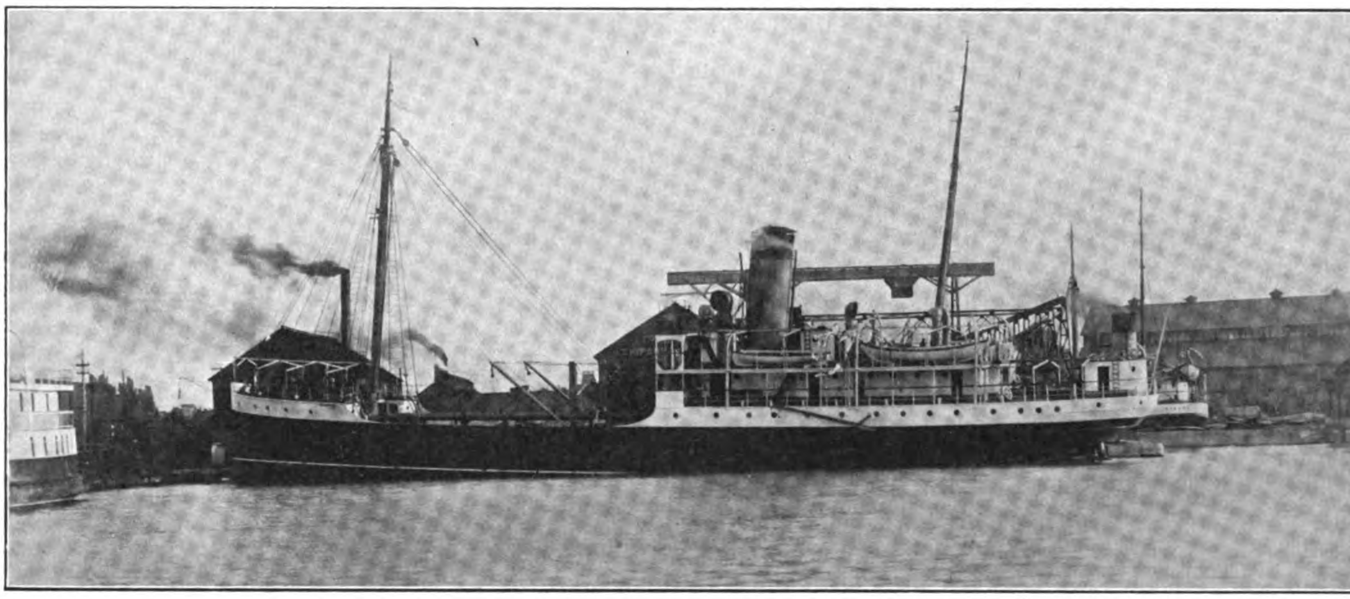
As heavy gas buoys have to be lifted on deck, special attention has been given to the arrangement of a heavy derrick on the foremast together with the necessary purchases and rigging of heavy steel wire. The motive power is supplied by a 20-ton, five-drum winch fitted under the forecastle, the levers for controlling which are led to the forecastle deck to enable one man to handle the hoisting, guying and other necessary motions. On completion the mast, derrick and winch were subjected to a test load of 30 tons, which was handled in a satisfactory manner. The other deck machinery consists of a steam warping windlass, and two heavy winches situated on the forecastle deck, a boat hoist winch on the boat deck, a warping capstan at the after end of bridge deck, and a quadrant, steam and hand steering gear fitted in a steel house aft. All the above machinery and gear is of British manufacture.

The Dining Saloon

The dining saloon, which is situated on the main deck aft, is paneled in oak and upholstered in leather to harmonize with the walls. The ceiling is paneled in pine, painted flat white and tastefully decorated. A dining table to seat eight persons is provided, also two small circular side tables, two large easy chairs upholstered in leather, two handsome oak sideboards, an oak book case, etc. The floor is covered with heavy cork linoleum, on which is laid an artistic pile carpet, tapestry curtains being fitted to the ports and doors. The apartment is supplied with light and air by a teak wood skylight overhead, while two large ceiling electric fans are provided for use in hot weather.

A handsome polished mahogany staircase leads from the saloon to an entrance house on the bridge deck from which access is had to two special staterooms of large size which are provided for the use of the government officials. The entrance is paneled in polished mahogany and upholstered in first quality moquette, while the staterooms are paneled in pine, enameled white. Each is fitted with two bedsteads having nickel plated lee rails and spring mattresses, polished mahogany wardrobes, folding lavatory, easy chairs upholstered in moquette, curtains for sidelights and doors, etc., a heavy carpet, also cork linoleum being provided for the floor.

The captain's and chief officer's cabins are situated on the bridge deck, and are fitted and finished in a similar manner to the two staterooms.



THE CANADIAN LIGHTHOUSE TENDER ESTEVAN, BUILT BY THE COLLINGWOOD SHIP BUILDING CO., COLLINGWOOD, ONT.

A large and handsomely furnished mess-room is provided near the dining saloon for the use of the officers. The accommodation for the junior officers, engineers and petty officers is situated amidships under the bridge on either side of the engine and boiler casing. Each room is finished in polished hardwood and tastefully upholstered in velvet plush. Curtains are provided for doors and windows and the floor is covered with cork linoleum, carpet squares being also provided. Beds with spring mattresses and brass lee rails, wardrobes, bureaus, drawers and folding lavatories with fresh water supply, etc., are fitted. A similar mess-room is also provided for the use of these officers. Accommodation for 12 seamen and 16 firemen is provided in

the lower deck forward, fitted up in the latest and best sea-going style.

The sanitary accommodation throughout the ship is on the most modern principle and comprises a large bath room for the officials, with porcelain enameled bath tub, porcelain valve closet, handsome basin, toilet fixtures, etc., the floor being neatly tiled and covered with gratings. A bath room with porcelain enameled bath tub and porcelain basin is supplied for the engineer and one for the officers. Shower bath, lavatories and closets are fitted forward for the crew. The steward's department is exceptionally well provided for and comprises a large well-ventilated galley replete with all the latest cooking appliances, situated at the front of the bridge, and a well furnished pantry near the saloon. For the preservation of food a large refrigerator is fitted on the lower deck at the after end of the vessel and is divided up into meat, vegetable, ice and handing rooms. Alongside the refrigerator is also fitted a large room for carrying bulk stores. The rooms are cooled by brine circulation from a CO_2 machine supplied by Messrs. J. & E. Hall, and fitted in the main engine room.

Electric Equipment

Electric lighting is provided throughout the vessel by two dynamos of 110 volts, direct-coupled to enclosed engines running at 500 revolutions per minute. The wiring is on the double wire system and cables passing through cargo spaces and engine and boiler rooms, are armored, while those in the cabin accommodation are lead covered. The globes for the lights in the dining saloon are of cut glass, those in the remaining cabins throughout the ship being frosted. A powerful searchlight of 25,000 candle power is fitted on the flying bridge, but arranged so that it can be maneuvered from on deck or from inside the pilot house. A system of electric bells is provided from the pantry to the dining saloon, state rooms, entrance, captain's cabin, chief engineer's room and bath rooms, white electric fans are fitted in the saloon, state rooms, captain's cabin, officers' mess and chief engineer's cabin.

A complete installation of wireless telegraphy has been installed in a steel house situated on the boat deck, and consists of spreaders, insulators, generators, switchboard, accumulators, transformers, aerials, etc., etc., all in accordance with the most modern practice.

The propelling machinery consists of two sets of triple-expansion surface condensing engines having cylinders 15 in., 25 in., 42 in. and 26-in. stroke, running at 130 revolutions per minute. Steam is supplied by two Scotch multitubular boilers, 10 ft. 6 in. by 14 ft. diameter, working under Howden's forced draft, the working pressure being 180 lb. per square inch. The auxiliary machinery consists of two centrifugal circulating pumps, two air pumps, two feed pumps, also bilge, sanitary, fresh water, ash ejector, ballast and general service donkey pumps. A large evaporator feed heater and filter have also been installed. The propellors are of bronze, and each is fitted with four blades. A large engineer's workshop is fitted adjacent to the engine room and contains a 6-in. center lathe, a drilling machine to drill up to 1½ inches diameter, a shaping machine, emery wheel, grindstone and three vises, the whole of the plant being driven by a 5 H. P. motor. A blacksmith shop has also been installed, fitted with forge, vise bench and other appliances necessary for carrying out the repair work in which the vessel will be engaged. The auxiliary machinery, deck and engine room and steward's stores, also plate, etc., has been furnished almost without exception by firms in Great Britain.

The vessel ran her official trials over the measured mile course at Owen Sound on Oct. 22, when highly satisfactory results were obtained. On returning to Collingwood the machinery was opened up for examination and the vessel put in trim for her long voyage to Victoria, B. C., by way of Cape Horn. During the trials the department of marine and fisheries was represented by Mr. Doutre, purchasing and contract agent for the department of marine and fisheries; Chas. Duguid, naval constructor, under whose supervision the vessel has been built, and Comdr. Howe. The builders were represented by Capt. McDougall, president of the Collingwood Ship Building Co; James M. Smith and J. S. Leitch. During the trials the vessel was under command of Capt. P. M. Campbell, of Collingwood.

Importing Ships' Material Free

The treasury department has announced its interpretation of that clause in the Panama canal act, which permits ship materials to be imported free. There has been considerable concern over the matter and at one time it looked as though the department would permit the importation of a whole ship in a knocked-down condition. The president found it necessary to take hand in the matter and the regulations as announced embody doubtless some of his views. The preliminary drafted regulations as sent out by the treasury department interpret the points in controversy as follows:

A vessel will be defined as any water craft entitled to be documented under the laws of the United States, and similar craft for which there is no such requirement such as battleships, revenue cutters and government vessels. This will include every vessel of over 5 tons, whether used by the government, for commerce or for pleasure.

Machinery will not be entitled to free entry. Included in the term "machinery" will be auxiliary machinery such as pumps, steam winches, hoisting engines, electric motors and generators and condensers.

The term "outfit and equipment" will be defined as including all portable articles not permanently incorporated in the hull or machinery and will include rigging, tackle, boats, life saving apparatus, wireless apparatus, searchlights, lamps, bedding, furniture, tableware, small arms, etc., but will not include consumable supplies such as coal, food, medicines, etc.

The term "outfit and equipment" will also be held to include not only the original outfitting and equipping, but also renewals and replacements.

Materials will be defined as including merchandise suitable for use in the construction or repair of a vessel or to be incorporated therein after having undergone a process of manufacture subsequent to importation or in its condition as imported provided it has been purchased in the open market and was not constructed or fabricated on a special order or after a special design. This would include raw material such as pig iron and lumber, rough forgings and castings, but not finished ones, nuts, screws, bolts, steel plates, ships' knees, flooring and other things which though complete articles are useful as parts in the construction of something else.

The word "articles" is defined as including only such articles as are suitable for use in their condition as imported. In the outfit or equipment of a vessel such articles may be fitted, polished, painted or otherwise improved or fixed in place subsequently. Shipbuilding materials may be entered for warehouses and withdrawn as desired within three years from date of importation free of duty upon compliance with the regulations.

Isherwood Construction System-IV

In Which the Author Deals With the Longitudinal and Transverse Framing

By Robert Curr

The plan with this article shows the longitudinal and transverse framing of the vessel as it would look when the vessel is framed ready for the outside plating. It might be better termed the skeleton than the other showing the lines only.

The longitudinal frames marked A, C, D, E, F, G, H, K, M, N, O, P, R, compose the longitudinal framing of the vessel. On the great lakes of America these frames are numbered from the keel to the deck.

I am lettering these frames so that the reader may not get mixed up with the transverses, which are numbered from No. 1 to No. 31.

The longitudinal framing is by no means new, for the Great Eastern and a few vessels were built at that time on the lengthway system of framing.

In order to get longitudinal framing then, the cross section became intercostal, while the Isherwood system is continuous in both cases.

The transverses in the Isherwood system are simply the web frames used in the cross framing of vessels. These transverses are slotted out for the longitudinals to pass through and inside of the slots the web may be made to suit any requirements.

The transverse sections of the vessel being fair the hull is considered in ship shape. Reference may only be made to the body and sheer plans for the fairing up of the longitudinal frames. In this case the midship frame measures around the half girth 37 ft. 4 in. This length is divided by 14 and gives 13 frames, spaced 32 in. apart. This spacing of longitudinal frames is carried out as near as possible from stem to stern, as shown by body plan.

Where the vessel becomes fine at the bow and around the boss it simplifies matters by putting in short transverse frames, as shown by a, b, c, forward, and d, e, f, aft. The longitudinal frames are stopped short of the intermediate frames.

Frame A runs from the fore peak bulkhead to the intermediate frame d, which is watertight and forms the end of the water bottom.

The frame A is cut at the watertight divisions and connected to same with plate brackets and fastened with a number of rivets equal to the area of section of the angle composing the frame.

Frame C forms a longitudinal from the collision bulkhead to transverse No. 29.

Frame D forms a longitudinal from transverse No. 3 to transverse No. 27.

Frame E forms a longitudinal from transverse No. 4 to transverse No. 26.

Frame F forms a longitudinal from transverse No. 5 to transverse No. 24.

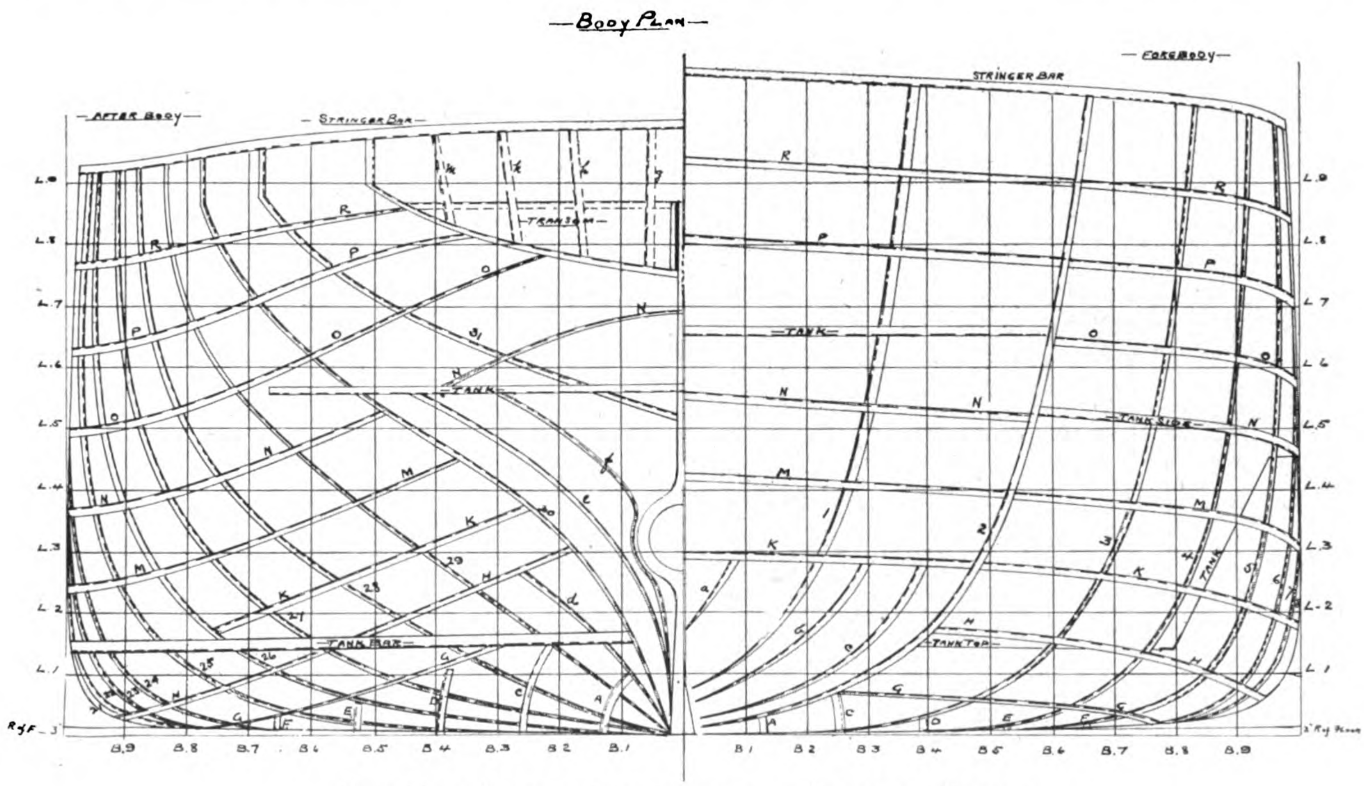
Frame G forms a longitudinal from the collision bulkhead to transverse No. 28.

Frame H forms a longitudinal from the collision bulkhead to transverse No. 27.

Frame K forms a longitudinal from the stem forming tank bar aft to transverse No. 30.

Frame M forms a longitudinal from the stem forming tank bar aft to transverse No. 30.

Frame N forms a longitudinal from



Body Plan, Showing Longitudinal and Transverse Framing

the stem (No. 2 to No. 20 tank at side) to transverse No. 30.

Frame O forms a longitudinal from No. 2 to transom frame.

Frames P and R form a longitudinal from stem to transom frame.

G and H frames at the after end stop at the tank top; H is continued above the tank to frame No. 30 and the intermediate is carried to H.

The frames above the tank top run parallel with the sheer and are cut at the watertight bulkheads, being made up at the bulkheads similar to the longitudinals in the water bottom.

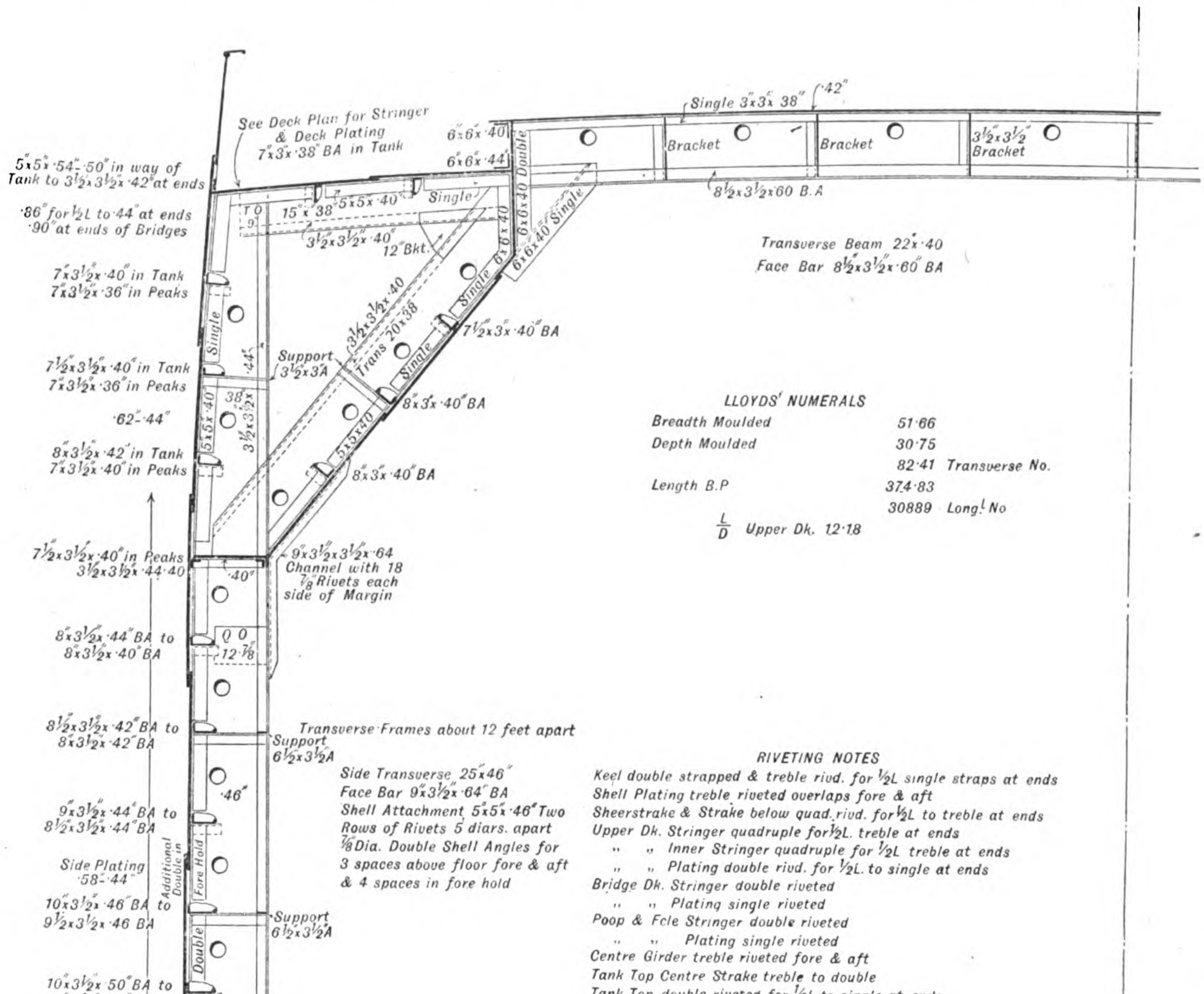
The longitudinals in the bottom are run parallel to the keel or center line of ship.

The deck longitudinals are run parallel to the center line as shown on the midship section. The three longitudinals at the side are of importance but the others are merely stiffeners.

Aft of the transom frame the longitudinals are slanted and are termed cant frames similar to the transverse framing arrangement.

Steamer Maskinonge

The steamer Maskinonge has recently been delivered from the shipyard of Short Bros., Sunderland, England, to the order of Liverpool owners for the Canadian coal trade, being under charter to the Dominion Coal & Iron Co., Sydney, Cape Breton Island. The steamer is intended to operate between Sydney and Montreal in the coal trade, making a round trip per week. The Maskinonge is 388 ft. over all, 375 ft. keel, 52 ft.



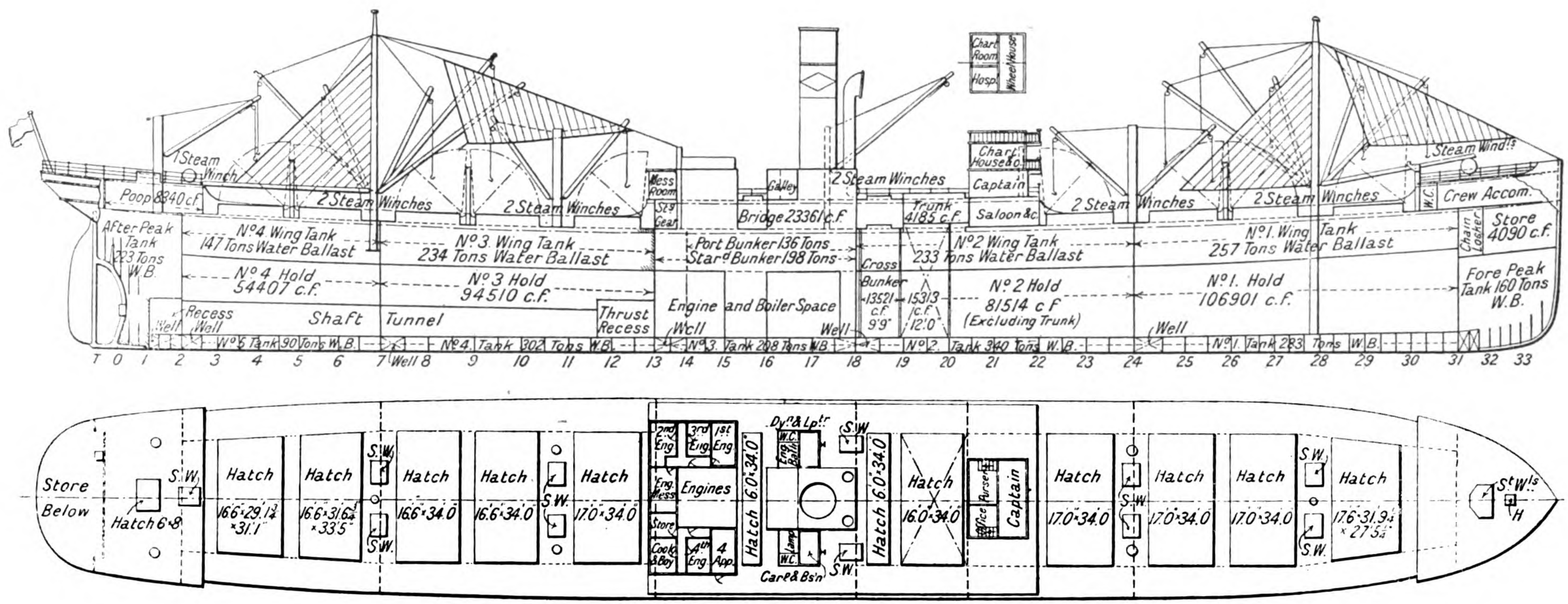
Midship Section of Steamer Maskinonge

	Drafts	Freeboard	Deadweight
Fresh Water	25' 4¾"	= 5' 8½" Side	= 8152 Tons
Indian Summer	25' 4¼"	= 5' 9" „	= 8132 „
Summer	24' 10¾"	= 6' 2½" „	= 7918 „
Winter	24' 5¼"	= 6' 8" „	= 7704 „
Tons per Inch at Load Water Line			39

Length	375' 0"	Tonnage U.D.	4512·80
Breadth Ext.	52' 0"	„ Gross	4804·28
Depth Mld	30' 9"	„ Nett	2676·01

Engines

Cylinders 26 × 44 × 73. Stroke 48". 3 Boilers 180 lbs.



Bunkers.

Port Bunker	136 Tons
Stard „	198 „

Note. Bunkers taken at 45 c.f. = 1 Ton

Contents of Holds.

Nº 1. Hold	106901 c.f.
Nº 2 Hold	81514 „
Cross Bunker	13521 „
Nº 3. Hold	94510 „
Nº 4. Hold	54407 „
Poop	8340 „
Bridge (Including Trunk)	23361 „
Fore Peak Store	4090 „
Total Capacity	386.644 c.f.

Note. Cubic Capacities are taken from top of Beams to top of Ceiling and to Outside of Frames.

Water Ballast.

Nº 1. Tank	283 Tons
Nº 2. „	340 „
Nº 3. „	208 „
Nº 4. „	302 „
Nº 5. „	90 „
After Peak	223 „
Fore Peak	160 „
Total Contents of Double Bottom and Peaks	1606 Tons
Nº 1. Wing Tank	257 „
Nº 2. „ „	233 „
Nº 3. „ „	234 „
Nº 4. „ „	147 „
Total Water Ballast	2471 Tons

Inboard Profile, Deck Plan and Leading Particulars of Steamer Maskinonge

beam and 30 ft. 9 in. molded depth, carrying 7,918 tons on 24 ft. 10 in. draught. She has ten large hatches fitted with telescopic covers, and is entirely self-trimming. The propelling machinery consists of a set of triple-expansion engines with cylinders 26, 44 and 73 in. diameters with a stroke of 48 in. Steam is supplied by three boilers, 14 ft. 6 in. by 11 ft. 6 in., carrying a working pressure of 180 lbs. per sq. in., equipped with Howden's forced draft. The steamer is built on the Isherwood system and has a water ballast capacity of 2,470 tons. Full particulars of her construction are given in the accompanying midships and longitudinal sections.

Molasses Steamer Nelson

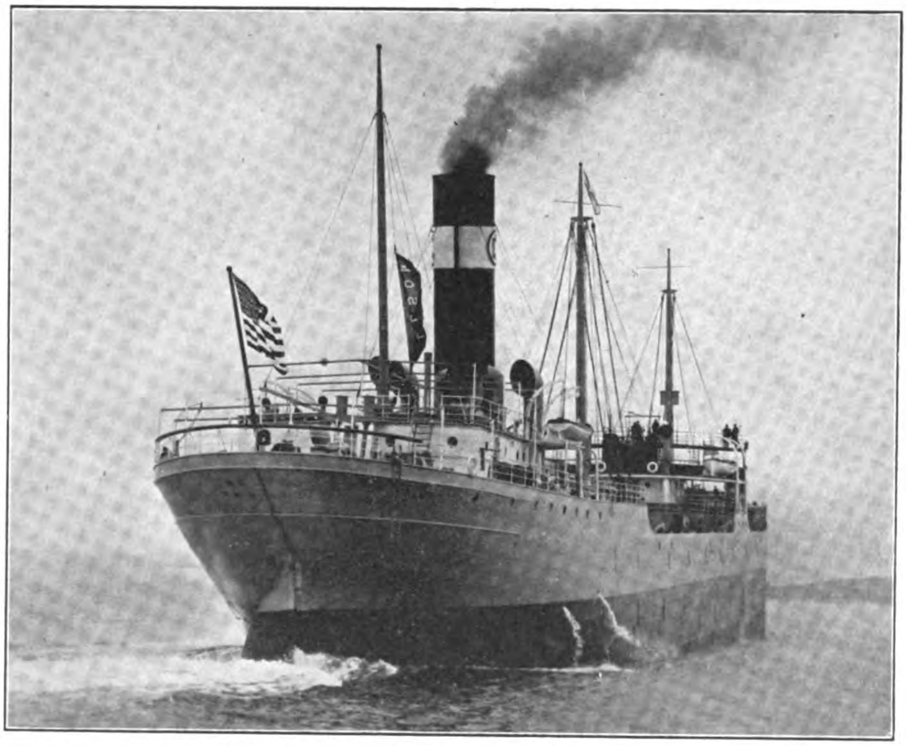
The steamer Nelson, built to the order of the Cuba Distilling Co., of New York, by the Fore River Ship Building Co., Quincy, Mass., left the builder's yard Nov. 17 on her maiden trip to Cuba for a cargo of molasses. cipally New York. She is also constructed in such a way as to enable her to enter the trans-Atlantic trade.

The principal dimensions are as follows:

	Ft.
Length between perpendiculars..........	370
Beam, molded	52
Depth molded to upper deck...........	30
Draught, loaded	23
Gross tonnage, about..................	4,700
Net tonnage, about.....................	2,800

The vessel can be used for the transportation in bulk of molasses, oil, or other liquid cargo. The total stowing capacity for molasses is 190,000 cu. ft., representng over 1,400,000 gals. When carrying petroleum, with the oil carriage and tanks and inner bottom, the vessel will have a capacity of 1,600,000 gals.

The vessel has three pole masts fitted with cargo booms having a capacity of five tons each. The propelling machinery is located in the stern of the ship, consisting of a vertical inverted three-cylinder triple-expansion engine with cylinders 25 in., 41 in. and 68 in. and a common



Molasses Steamer Nelson, Built by the Fore River Ship Building Co. for the Cuba Distilling Co.

The keel of this vessel was laid on May 13 last, and the vessel was launched on Aug. 12, the christening being performed by Miss Madeline E. Mayer, daughter of Mr. and Mrs. Levy Mayer, of New York.

The Nelson is an improved duplicate of the steamer Currier, built by the Fore River Ship Building Co. and owned by the Cuba Distilling Co., and will be engaged in the transportation of molasses in bulk between Cuba, Porto Rico and American ports, prin- stroke of 48 in., supplied with steam at 190 lb. pressure by three single-ended Scotch boilers, working under the heated forced draft system. The engines will develop a maximum of 2,700 H. P., which will give the vessel a speed of more than 12 knots.

Robert W. Hunt & Co. have moved from the Rookery to the Insurance Exchange building, Jackson boulevard, Chicago, where they occupy more ample quarters.

Expansion of Swan & Hunter

Messrs. Swan, Hunter & Wigham Richardson, Ltd., at their Neptune Engine Works, Walker, Newcastle-on-Tyne, have for some years been actively engaged in studying and developing Diesel oil engines.

Two years ago they completed the twin screw cargo ship Toiler, which has the distinction of being the first oil-engined vessel to cross the Atlantic. She is owned by James Playfair, of Midland, Ont. Her builders at once followed up the Toiler with another similar twin screw cargo steamer for the same owner. The vessel is called the Calgary, and has greater engine power than the Toiler. Swan, Hunter & Wigham Richardson, Ltd., are now engaged in the construction of two much larger cargo boats for British owners, and carrying about twice the deadweight of the Toiler and Calgary.

As previously noted in The Marine Review, Swan & Hunter have in hand another interesting ship being built for the Montreal Transportation Co., of Montreal. This will be the first large vessel designed for propulsion by power transmitted electrically from the engine to the propeller. The designs of the engines have been executed by Henry A. Mavor, of Messrs. Mavor & Coulson, of Glasgow, who have already tried this system on a small experimental vessel called the Electric Arc. The deadweight cargo capacity will be about 2,500 tons. The machinery will consist of two 300-H. P. high speed Diesel engines, each with its own alternating current generator and exciter. Just ahead of the thrust block there will be a specially designed motor operating a single propeller, and reducing the 400 revolutions per minute of the Diesel engines to about 80 revolutions per minute. Among the advantages claimed for Messrs. Mavor & Coulson's system of electrical transmission it may be noticed that the total power of the propelling engine required in a single unit for direct drive can be split up into several sub-units, each with its own generator, all connected to a single propelling motor. Furthermore, all reversing and speed chanages can be done by switches, and the electrical control station can be placed in any convenient spot in the ship, e. g., on the navigating bridge, in the engine room, or elsewhere.

The firm has also for some little time been developing two-stroke cycle Diesel engines. Various well-known designs of this type of engine have been critically examined and the details exhaustively analyzed. The out-

come of all this study has resulted in the Neptune-Diesel engine, which for marine purposes is claimed to be second to none. The design is substantial in its strength, no undue risks being taken by imprudently cutting down weights. Another leading feature is much greater simplicity than is found in many Diesel engines. This means a smaller prime cost and less expense in running and maintaining the engine. The builders have also aimed at easy accessibility to all parts of the engine, which is of the highest value, if ever repairs are necessary. Several radical improvements have also been introduced in the valve gear, pistons, and cooling arrangements, all of which are distinctive features in the Neptune-Diesel engine.

The Neptune Engine Works, which have been established since 1879, have been frequently enlarged and improved, and the best of modern machines have from time to time been installed to replace older tools. Partly in order to develop the Neptune-Diesel engine more successfully, and also owing to the general expansion of business Messrs. Swan, Hunter & Wigham Richardson, Ltd., have now embarked upon a complete re-organization of their engine works. This department is to be moved to another site within the Neptune shipyard, and entirely new shops are being erected.

Light Ship No. 95

The Racine-Truscott-Shell Lake Boat Co., Muskegon, Mich., recently delivered lightship Milwaukee No. 95 to the lighthouse authorities at Milwaukee. The principal dimensions of the lightship are:

Length over all, 108 ft. 5 in.
Length on waterline, 90 ft.
Beam, molded, 23 ft.
Depth of hold, 12 ft. $2\frac{1}{2}$ in.
Displacement at 10 ft. 1 in. mean draught, 312 tons.

The vessel is built of steel, the hull being sub-divided by five transverse watertight bulkheads, watertight flat at bow and stern with bulkheads forming trimming tanks. She has three decks, the main and spar decks being continuous and the lower deck extending from the stem to the coal bunker bulkhead and from the stern post to the engine room bulkhead. The vessel is rigged with a mainsail, foresail and forestaysail. The frames are spaced 20 in. apart. They are $3 \times 2\frac{1}{2} \times 7/16$ in. for about one-half of the vessel's length, being reduced to $3 \times 2\frac{1}{2} \times \frac{3}{8}$ in. forward and $3 \times 2\frac{1}{2} \times 5/16$ in. aft. The frames extend from the keel to the under side of the spar deck stringer plate and to the under side of the main deck stringer plate alternately.

The machinery consists of a single-cylinder, non-condensing engine, 18 in. diameter and 20 in. stroke, having a piston valve operated by Stevenson link and reversible by hand. Steam will be furnished by two single Scotch boilers, 8 ft. 6 in. diameter and 10 ft. long, allowed 110 lbs. pressure.

The officers and crew are housed aft. The new lightship will be equipped with a 100,000-candlepower light mounted on a steel tower rising 20 ft. above the spar deck. She will be anchored about three and one-half miles off shore due east of the pier headlights of Milwaukee.

Panama Canal Tolls

President Taft has issued a proclamation fixing the Panama canal tolls upon the basis of \$1.20 per net ton with a reduction of 40 per cent on ships in ballast. These figures are based upon statistical data compiled by Prof. Emory R. Johnson, of the University of Pennsylvania, regarded as the country's leading expert on transportation problems. Briefly the provisions are:

First, on merchant vessels carrying passengers or cargo, \$1.20 per net vessel ton—each 100 cu. ft.—of actual earning capacity.

Second, on vessels in ballast without passengers or cargo, 40 per cent less than the rates of toll for vessels with passengers or cargo.

Third, upon naval vessels other than transports, colliers, hospital ships and supply ships, 50 cents per displacement ton.

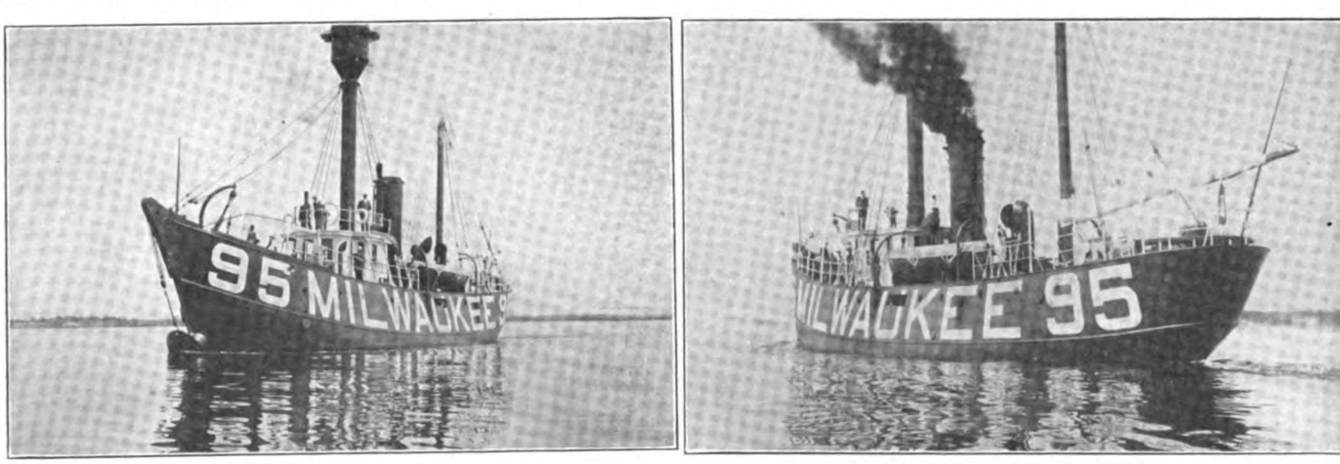
Fourth, upon army and navy transports, colliers, hospital ships and supply ships, \$1.20 per net ton. The vessel to be measured by the same rules as are employed in determining the net tonnage of merchant vessels.

American coastwise vessels are of course exempt from the payment of these tolls, but American vessels engaged in foreign trade will pay the tolls the same as the vessels of any other country.

These rates are virtually the same as the Suez canal rates. The Suez rate during 1911 was \$1.30 per net ton. When it is considered that the Suez rates have undergone a gradual reduction since the canal was opened to commerce 43 years ago, it will be seen that the Panama rates are really low. They actually begin at the lowest figure that the Suez rates have ever reached.

Prof. Johnson has made elaborate calculations as to probable commerce and estimates that about 9,000,000 tons of foreign traffic will pass through the canal during its first two years of operation. He estimates that by 1920 the traffic will amount to 11,000,000 tons and by 1925 to 14,000,000 tons. He believes that the rate can be reduced to \$1 per net ton in 10 years and that the canal will be self-supporting in 20 years, basing this calculation upon an increase of 60 per cent in traffic every 10 years.

Apparently the whole purpose of fixing the tolls at these figures has been to meet the competition of Suez.



LIGHTSHIP MILWAUKEE 95, LOOKING FORWARD AND AFT

A Most Spirited Meeting

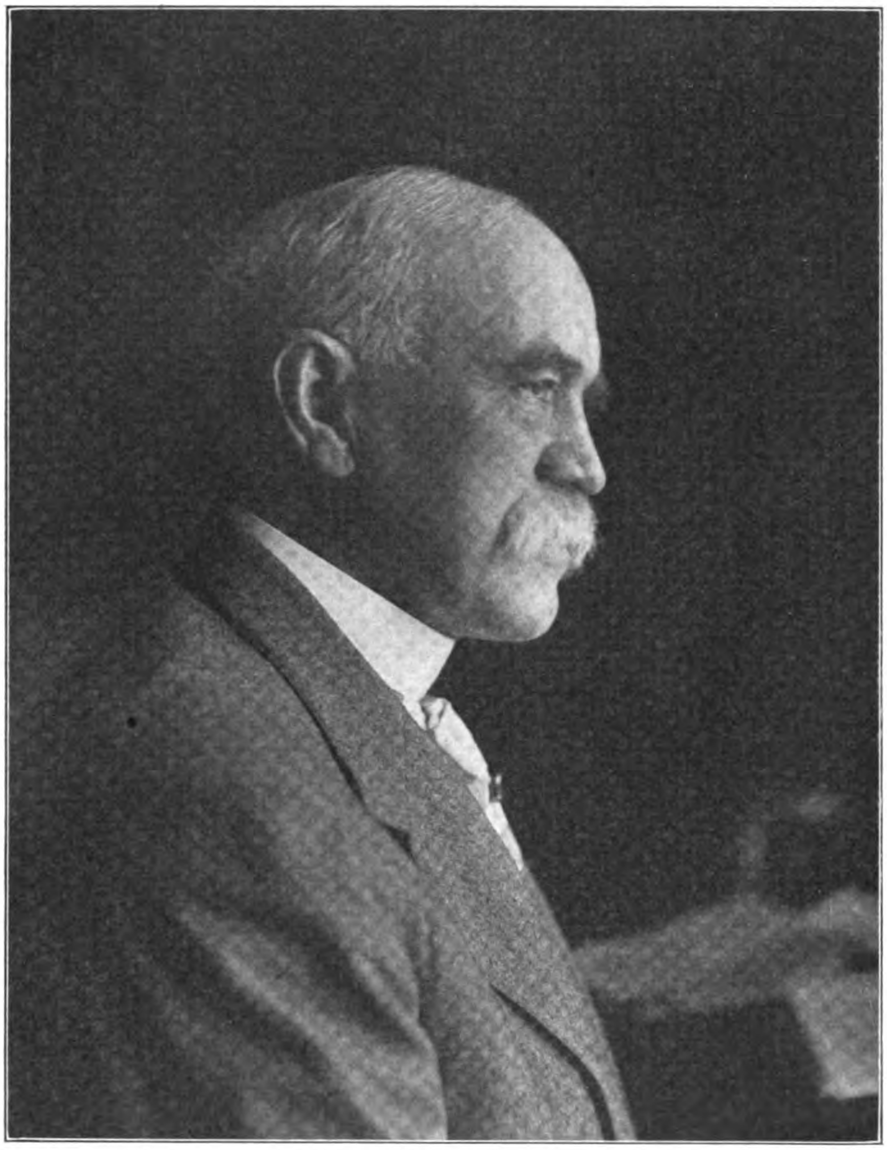
The Twentieth Annual Session of the Society of Naval Architects and Marine Engineers

THE twentieth annual meeting of the Society of Naval Architects and Marine Engineers was held in the Engineering Societies building, 29 West Thirty-ninth street, New York, on Nov. 21 and 22. In point of attendance it was the largest meeting that the Society has ever held, and in point of interest the most animated of recent years. President Stevenson Taylor presided.

The annual report of Secretary and Treasurer Cox showed total resources of $22,116.66, against which there was a liability of only $240. The membership increased during the fiscal year from 730 to 733, notwithstanding that sixteen deaths and twenty-two resignations occurred during the year. Adding the new members elected at the meeting, the total membership stands today at 785.

The members stood while the death roll was read, as follows: Clement A. Griscom, Robley D. Evans, George W. Melville, Thomas Andrews Jr., Wm. W. Bates, Walter A. Post, Henry W. Spangler, D. Howard Spear, Roger P. Stebbins, Francis H. Stillman, J. W. Lowry Waters, Emil L. Boas, John C. Silva, Samuel W. Stanton, Samuel B. Thomas and Howard Wood. The following were elected members of council for the term ending Dec. 31, 1915: Naval Constructor W. J. Baxter, W. D. Forbes, Lewis Nixon, Major L. H. Chandler, Andrew Fletcher, H. A. Magoun. John S. Hyde and Harvey D. Goulder were elected associate members of council. During the summer, Capt. A. B. Niblack was made vice president, to fill the vacancy caused by the death of Rear Admiral R. D. Evans. George W. Dickie was made vice president, to fill the vacancy caused by the death of Rear Admiral George Wallace Melville. Capt. C. A. McAllister was made member of council, to fill the vacancy caused by the death of W. A. Post. H. S. Grove was made associate member of council, to fill the vacancy caused by the promotion of Commander Niblack. Naval Constructor Frank A. Fernald was elected honorary vice president, and Lewis Nixon was elected vice president, to fill the place of Mr. Fernald. Monsieur Bertin was elected honorary member of the Society. The executive committee consists of Rear Admiral W. L. Capps, F. E. Kirby, W. I. Babcock and Stevenson Taylor.

The rules of the Society forbid a president's succeeding himself and accordingly the Society elected Col. Robert M. Thompson president, re-electing D. H. Cox as secretary and treasurer. Before the sessions ended, a spontaneous tribute of affection was paid to the retiring president, Stevenson Taylor, who was deeply moved thereby. In his annual address, President Taylor said:



Col. Robert M. Thompson
President of the Society of Naval Architects and Marine Engineers

PRESIDENT TAYLOR'S ADDRESS

"I welcome you to the twentieth annual meeting of the Society of Naval Architects and Marine Engineers, and congratulate you on your successful career. Your numbers have more than kept pace with the growth in the number of shipyards and kindred establishments; your treasury is in good condition, and your work is entirely praiseworthy.

"When we consider that on the roster of this Society there are the names of those who are responsible in one way or another for the design and construction of every important vessel and its equipment in the naval and merchant service of the United States; and feel that in all things these men, so far as opportunity is given, are advancing yearly the science of shipbuilding, we have the right to feel proud of its membership.

"Our navy has grown steadily greater, better and more efficient, and it is only necessary to have the support of our citizens to continue to do so and to hold its rightful place in the world.

"Our merchant service is doing as well as it can; our shipyards are fairly busy, though it remains to be desired that there shall be so much greater demand for new ships that many new yards will be necessary.

"The progress in the development of power for ships has been especially interesting during the past year. It is reported that at present there are thirty-four ships under construction abroad, with Diesel oil engines, twenty-three of which range from two thousand to ten thousand tons.

"The use of high speed turbines with comparatively low speed efficient propellers driven by intermediate gearing is being used under several different methods of combination; and we are now awaiting with great interest the trial of the latest development, namely, the combination of turbines and electric motors, which will soon be driving one of the large colliers of the United States navy.

The Reciprocating Engine

"All of these schemes have advantages, while our aged friend, the reciprocating engine, is still doing business at the old stand, though sometimes in combination with its rival, the turbine. It will be interesting for you to study the relative advantages and disadvantages that you may determine which combination will best answer the particular purpose for which you are called upon to design ships. It seems quite clear at present that no one scheme is best for all purposes.

"Some of the papers of this meeting and the discussion thereof will add to your fund of knowledge. Important matters that have been under consideration by your council and those that have been referred to certain committees are: The raising of an endowment fund, from the income of which may be annually awarded medals or prizes to the younger members for professional papers of special merit and extraordinary expenses that occasionally occur may be paid without using the regular income which now enables us to publish our high standard proceedings; and the advisability of changing the date of our annual meeting to nearly one month later in the year in order better to enable our members from the west and great lakes to attend the meetings, the present time happening to be very inconvenient for those members on account of business conditions existing for them between Nov. 15 and Dec. 15, each year. The committee will appreciate suggestions from the members on these matters.

The American Merchant Marine

"The American merchant marine has always been one subject that your presidents have felt called upon to mention in their addresses. I thought last year that I would not venture again to speak on that topic, but recent action of congress and recent action of the people at the polls impel me to say a few words.

"One is tempted to quote Shakespeare's Richard III, using but the first half of the sentence and say, 'Now is the winter of our discontent.'—

"The party so long in office has accomplished nothing, unless it be possible that the riders forced upon the act governing the management of the Panama canal—can really be in any way construed to be advantageous. The president-elect in his letter of acceptance of his nomination gave us some ringing sentences like these: 'Without a great merchant marine we cannot take our rightful place in the commerce of the world.'—'It would be a little ridiculous if we should build it (the Panama canal) and have no ships to send through it,' and his conclusion is, 'That we must build and buy ships in competition with the world. We can do it if we but give ourselves leave.'

"It is not to be expected that a candidate in his letter of acceptance, covering so many important issues, would foretell how soon we can *build* ships in competition with the world, or if we bought ships abroad how we may run them in competition with the world, even with a modified tariff, any more than the president in the midst of an important political campaign can be expected to justify the signing of a Panama canal act with riders containing legislation not germane to the subject of the act, being thus quite inconsistent with his own previous action on another bill.

The Titanic's Engineers

Far below in the depths of the ship they well knew long before those on deck of the fatal hurt the ship had received. Of those directly employed by the steamship company, who were called to their places as a matter of regular duty, and of those on assumed duty in behalf of the builders, who were at the time in no way responsible for the management of the ship, not one was saved. 'There were many glorious examples of heroism on deck, but none more glorious, none showing greater self-sacrifice, than the examples given by that splendid engineer corps remaining below, awaiting the end without the slightest possible chance of life. All honor to those true, brave men.

"It is easy to cry, 'We cannot build ships as cheaply as abroad; alter our registry laws and let us buy our ships where we will,' but the fact still remains, we cannot run such ships in competition with the world until many other demands of our laws, times and usages have been considerably modified.

"Perhaps the party soon to come in power with its distinguished leader may with new tariffs produce results under which we may build, buy and run ships in competition with the world, and thus construct a merchant marine worthy of this great country. Such adjustment of tariffs will be pretty near complete free trade, and our country may be happy under the new conditions. Having always been a protectionist with no special interest, with only the interest of the whole country at heart, I have grave doubts, which are only increased by observation of free trade countries abroad. We must still be patient. It is evident that the president-elect recognizes the existing situation of our merchant marine, but I feel on this subject like quoting again—this time a modern poet:

> "Behold! We know not anything
> We can but trust that good shall fall
> At last—far off—at last to all
> And every Winter change to Spring."

"The one overwhelming event of the year which more than any other directly interests Naval Architects and Marine Engineers, was the loss, in April last, with its awful consequences, of the splendid Titanic, the latest work of one of the great shipbuilding yards of the world.

The Loss of the Titanic

"No previous disaster at sea, great as some have been, ever produced the consternation and appalling feeling of man's impotence than was caused by the foundering of what was considered the last word in ocean steamship construction.

"This terrible event has been the occasion of investigation at home and abroad with sundry conclusions as to the responsibility for the disaster and the need of changes in the various requirements for the future. You are aware of all that has been said and done, for a matter of such vital interest to everybody must have received from every member of this Society the closest attention and most careful consideration. You have perhaps attributed the disaster to a combination of circumstances never happening before, in which combination occurs human judgment upon which, in all walks of life, in all spheres of action, so much must depend.

"It is not our purpose now to sit in judgment. That particular combination may never occur again, and as Associate-Member Herbert L. Satterlee, in his An April Crossing, published last June, sagely says, 'The human brain cannot compute the combinations of circumstances or unusual or extraordinary conditions that may occur to the great ocean. Man may avoid many dangers, he can multiply the means of safety and methods of rescue, but he cannot annihilate the 'peril of the sea'.

"True, we cannot annihilate the peril of the sea, and we must depend in crises on human judgment. There remains for the men of our professions all the greater responsibility to make our work safe.

"Since the loss of the Titanic much stress has been laid upon the need of more life boats, and more life rafts. Indeed, as the laws now stand, it is quite within probability that there may be more life boats and rafts than can be properly and quickly handled in time of trouble.

"I have frequently gazed upon the great steamers that now cross the sea and then turned to look at the life boats. The thought that at any time one should be compelled, by stress of weather or accident, to leave the ship and put off for safety in the compar-

atively tiny life boat seemed rather absurd. ***It is infinitely more important to make the steamer itself safe than to depend upon the life boat, or, at worst, upon the life raft.*** We must build our ships so sub-divided by decks and water-tight bulkheads—without doors where possible—that even an injury like the Titanic's would not cause her to founder.

"Further, we must be sure that the plating shall always have such ductility that ruptures in case of severe indentation shall be reduced to the minimum.

"Do not infer that the plating of the Titanic was not of this character. Of this I have no knowledge and it is rather certain that no plating could withstand the shock caused by such a mass, traveling at so great a speed, coming in contact with a mountain; but we have seen plating so broken by collisions that warrants the statement sufficient care has not always been taken in the quality of plating used on ships.

"It will be impossible at all times to make bulkheads and decks as indicated, for such a demand faithfully executed might destroy the earning power of the ship; but there are many conditions that can be made better, and we must do what we can in designs and construction, educating owners, if need be, to at least closely approach the desired absolute safety, safety in spite of the possible fallibility of that human judgment which cannot be—and should not be—entirely eliminated.

Tribute to Engine Room Force

"One more word in reference to the Titanic—a tribute to those in the engine rooms at the time of the disaster. In our work we meet and know this class of men. Far below in the depths of the ship they well knew long before those on deck of the fatal hurt the ship had received. Of those directly employed by the steamship company, who were called to their places as a matter of regular duty; and of those on assumed duty in behalf of the builders who were at the time in no way responsible for the management of the ship, not one was saved. There were many glorious examples of heroism on deck, but none more glorious, none showing greater self-sacrifice than the examples given by that splendid engineer corps, remaining below awaiting the end without the slightest possible chance of life. All honor to those true, brave men!

"You have just elected as your president for the next term Col. Robert M. Thompson, a gentleman well and favorably known the country over as a man of great public spirit, evidenced continually by his interest in affairs national and international, and whom to know is to respect and honor. I tender him and the Society my congratulations. He can still widen the results of his public efforts, and the Society has secured a most admirable presiding officer, who will carefully watch its interests.

"Not until Dec. 31, next, will my term of office as your president expire, but practically the duties will terminate with this meeting. The council and certain other very partial friends have been kind enough to express the wish that I might continue in this office, but I firmly believe and trust that you do—that it is a very wise provision of our constitution that 'the president shall not be eligible for election as his own successor'.

"Though, as I have said, my duties continue until the end of the year, this is the time and place for me to acknowledge with gratitude the great honor you conferred upon me three years ago, an honor unsolicited and unexpected, an honor which coming from a professional society of your importance, is the highest that can be conferred upon one by his associates.

"I said on accepting the office that it would be my privilege to serve. I have not succeeded in accomplishing all of the things I hoped for. I fear no man with a proper desire for achievement ever quite does this, but I have tried to serve you well, have enjoyed the work and its attendant associations and have always received the utmost support of your council. I can ask no more. I can ask no more. I thank you one and all. I will always bear the kindest and most tender thoughts for the Society of Naval Architects and Marine Engineers."

The sessions of the Society were brought to a close with the annual dinner at the Waldorf-Astoria, the speakers being: Beekman Winthrop, assistant secretary of the navy; Hon. Wm. C. Redfield, Hon. Henry W. Hill, Hon. James W. Osborne, Elwood M. Rabenold and Col. Robert M. Thompson.

Those in Attendance

Those in attendance at the sessions and dinner were:

S. Almy, J. J. Amory, D. Almy, E. H. B. Anderson, W. Ancker, H. L. Aldrich, Calvin Austin, Roland Allwork, A. Allen, G. D. Ali, J. H. Andrews.

J. E. Bailey, G. P. Blow, M. Broady, J. D. Bouret, G. K. Bradfield, C. F. Bailey, Wm. Binley Jr., W. J. Baxter, C. F. Buckelew, J. M. Blankenship, A. E. Borie, A. H. Ball, M. K. Bowman, Jos. Barre, G. E. Best, H. I. Brisner, J. S. Blackett, H. H. Brown, Ed. Boy (commander), Burstyn (commander), F. T. Bowles (guest table), R. Blum, W. I. Babcock, G. E. Burd, C. T. Bishop, M. Buchanan, C. E. Burney, G. H. Bull.

Irwin Chase, T. M. Cornbrooks, W. L Capps, G. Cornett, H. I. Cone, D. H. Cox, C. A. Carr, W. F. Carnes, A. W. Christian, J. M. Cherry, H. N. Covell, G. A. Christoffer, W. E. Cogkendall, J. H. Chalker, A. Collins, James Craig, Mason S. Chase, W. D. Cocks, Clinton H. Crane.

Commander B. d'Azy, H. C. Davis, F. L. DuBosque, W. D. Dickey, G. W. Dickey, W. J. DuBois, J. C. Davison, James Donald, J. E. DuBois, Geo. B. Drake, H. Dixon, W. T. Donnelly, M. W. Day, W. S. Doran, S. H. R. Doyle, H. L. Desanqes.

C. M. Englis, E. H. Ewertz, H. A. Everett, J. M. Emery, M. Edson, W. L. Ebsen, C. B. Edwards.

H. N. Fletcher, A. Fletcher, W. H. Fletcher, F. L. Fernald, H. L. Ferguson, Wilson Ferguson, H. C. Farrar, Folger, J. French, D. E. Ford, W. D. Forbes, T. E. Ferris.

J. H. Gardner, Dean Goetze, J. R. Gordon, W. A. Gilroy, Capt. A. Gleaves, A. J. Grymes, R. E. Gillmor.

J. S. Hunsaker, H. L. Hibbard, J. E. Henderson, W. N. Howell, O. Z. Howard, H. C. Higgins, Wm. Hovgaard, R. S. Haight, Robt. Haig, J. F. Hopkins, C. S. Hoyt, A. L. Hopkins, H. C. Hunter, D. Howard, F. D. Herbert, R. Hutchinson, George J. Hermiston, O. L. Halenbeck, Hon. H. W. Hill, Chas. E. Hyde, Melville Hix, R. S. Haydock, D. E. Herrick.

D. J. Irish.

H. Jobson, H. L. Joyce, H. B. James, E. P. Jessop, A. E. Jordan, J. Johannson, H. E. Jones, F. Jarka, Eads Johnson, M. Jack, E. S. Jackson.

A. A. Kennedy, J. A. Kennedy, M. L. Katzenstein, J. W. Kellogg, G. Kotter, W. Katzenstein, L. Katzenstein, L. H. Kenney.

J. S. Leslie, S. I. Leslie, J. H. Linnard, J. W. Lee, Geo. F. Lawley, L. D. Lovekin, W. J. A. London, John Loyd, A. P. Lundin, Capt. Lockhurst, Simon Lake.

C. W. McGee, J. McGrath, A. J. Garvey, A. W. Murray, T. McGovern, W. T. Moore, R. McGregor, H. A. Magoun, J. W. Miller, Ed. McIntyre, Edmund Mills, Bernard Mills, E. M. McIlvain, Spencer Miller, C. A. McAllister, J. H. Mull, G. W. Magee, R. C. Monteagle, W. H. Millard, A. Moritz, T. A. McMillan, C. D. Mosher, A. J. Maclean, W. M. McFarland, D. Methison, B. S. Murphy, J. E. Meek, C. F. Magoun, C. J. Munch, Albert Moritz, A. M. Merrill, Thomas S. Miller.

Wm. Newman, H. P. Norton, H. O. Nickerson, T. Niven, Wm. Nish, Lewis Nixon, Samuel Newton, H. F. Norton.

A. V. S. Olcott, G. A. Orrok, Hon. J. W. Osborne.

John Platt, James Plummer, E. H. Peabody, N. F. Palmer, H. L. Potter, T. P. Purdie, W. B. Porter, M. Pressy, Capt. Proctor, Capt. Platt, W. P. Pendleton.

W. S. Rogers, R. R. Row, E. H. Rigg, J. R. Raymond, R. Ramsey, T. F. Rowland Jr., C. B. Rowland, T. Robinson, R. Rayburn, G. J. Robinson, L. Ruprecht, Hon. W. C. Redfield, E. M. Rabenold, C. E. Ross, W. H. Raab.

H. C. Sadler, R. C. Scholz, B. A. Sinn, H. R. Sutphen, H. G. Skinner, F. L. Sawyer, Jas. Swan, E. A. Stevens Jr., R. A. C. Smith, C. Skentelbery, E. Snow, L. Y. Spear, W. A. F. Smith, S. K. Smith, Linden Stuart, G. Schmitt, E. B. Sadtler, George Simpson, E. A. Sperry, E. A. Stevens, B. Somers, A. R. Smith, R. Stocker, Wm. Shaw, E. P. Stratton, W. P. Stephens, R. M. Smith.

G. P. Taylor, S. P. Taylor, W. H. Todd, S. Taylor, E. W. Turnure, J. G. Tawresey, Timson, W. B. Tardy, W. A. Thompson Jr., J. K. Turnbull, Col. R. M. Thompson.

K. A. Veit, W. E. Volz, F. Van Vleck, Capt. Van Duzer, Capt. D. S. Vasselheff.

W. Carlisle Wallace, C. P. Wetherbee, H. N. Whittelsey, C. M. Wales, L. W. Walker, W. A. White, J. G. Winship, R. M. Watt, G. E. Weed, G. H. Williams, W. E. Williams, W. J. Wilgus, H. Wheeler, H. W. Warley, D. T. Warden, Hon. Beckman Withrop, H. Watrous, J. F. Whitaker, W. T. Webster, C. D. Wallace.

Commodore Yang.

NEW MEMBERS ELECTED

The following were admitted to membership during the sessions:

Members

John M. Cherry, superintendent floating equipment, Lehigh Valley R. R. Co., Jersey City, N. J.

Karl Boy-Ed, naval attache, German embassy, Washington, D. C.

Edward P. Morse Jr., general superintendent, Morse Dry Dock & Repair Co., foot of Fifty-seventh street, Brooklyn, N. Y.

Charles M. Englis, 176 Clinton avenue, Brooklyn, N. Y.

John A. Moran, treasurer, Atlantic Basin Iron Works, 20 Summit street, Brooklyn, N. Y.

Thomas F. Newman, Cleveland & Buffalo Transit Co., Cleveland, O.

Lars Brath, assistant chief draftsman, Fore River S. B. Co., Quincy, Mass.

James L. Crandall, H. I. Crandall & Son Co., Boston, Mass.

James O. Gawne, assistant naval constructor, bureau construction and repair, navy department, Washington, D. C.

Thomas M. Gunn, designer and estimator, Electric Boat Co., Groton, Conn.

Harry R. Wheeler, secretary and chief engineer, Henry Steers, Inc., 17 Battery place, N. Y.

Arthur J. Grymes, manager, marine department, Erie R. R. Co., Hoboken, N. J.

Edward Wilding, naval architect, Harlan & Wolff, Belfast, Ireland.

James H. Kurtz, chief draftsman, Cramps Shipyard, Philadelphia.

George B. Drake, naval architect, 17 Battery place, N. Y.

Charles Jackson, chief engineer, marine department, the Texas Co., 17 Battery place, N. Y.

Donald Mathieson, superintendent engineer and naval architect, W. R. Grace & Co., Hanover Square, N. Y.

Henry W. Dixon, superintendent engineer, Coast Steamship Co., 32 Broadway, New York.

Edwin S. Alexander, assistant to general manager, Newport News Ship Building & Dry Dock Co., Newport News, Va.

William Gregory Esmond, assistant chief draftsman, Lake Torpedo Boat Co., Bridgeport, Conn.

John F. Nichols, assistant chief engineer, Newport News Ship Building & Dry Dock Co., Newport News, Va.

Geo. Uhler, supervising inspector, General Steamboat Inspection Services, U. S.

Francis A. Martin, ship and engineer surveyor, with Frank S. Martin, 52 Beaver street, N. Y.

David Dutrow Thomas, chief engine draftsman, marine department, Maryland Steel Co.

Pierce J. McAuliffe, engineer in charge of construction of hydraulic dredges, Morris Machine Works, Baldwinsville, N. Y.

Christrom Hinricks, chief engineer, Seattle Construction & Dry Dock Co., Seattle, Wash.

William D. Kearfott, marine department, Warren Steam Pump Co. of Warren, Mass., 95 Liberty street, New York.

Einar L. M. Sivard, engineer, Welin Marine Engine Co., 305 Vernon avenue, Long Island City, N. Y.

Samuel Newton, draughtsman, W. & A. Fletcher Co., Hoboken, N. J.

Henry N. Fletcher, secretary, W. & A. Fletcher Co., Hoboken, N. J.

Benjamin F. Ward, superintendent engineer, marine department, New York Central & Hudson R. R. R. Co., 330 Central avenue, Hoboken, N. J.

Frederick C. Lang, president, Tietjen & Lang Dry Dock Co., Hoboken, N. J.

Henry Q. Layman, marine engine department, the Pusey & Jones Co., Wilmington, Del.

Hugh L. Tims, superintendent, Harlan & Hollingsworth Corporation, Wilmington, Del.

Irwin Chase, chief draftsman, Electric Launch Co., Bayonne, N. J.

George Eli Burd, captain U. S. navy, engineer officer New York navy yard.

William H. Raab, Robins Dry Dock & Repair Co., 15 Whitehall street, New York.

Capt. H. M. Seeley, supervising inspector of steam vessels, 701 Custom House, New York.

William J. A. London, chief engineer, Terry Steam Turbine Co., Hartford, Conn.

Associates

Harry R. Raymond, steamship manager, Clyde Steamship Co., Atlantic Gulf & West Indies Steamship Co., Pier 36, North River, New York.

William L. Chapman, secretary, Merritt-Chapman Co., 17 Battery place, N. Y.

John M. Emery, manager, marine department, Delaware, Lackawanna & Western R. R. Co., Hoboken, N. J.

Robert C. Scholz, assistant to general manager, New England Navigation Co., Pier 19, N. R., N. Y.

William H. Pleasants, general manager, Ocean Steamship Co., Pier 35, N. R., New York.

Herbert B. Walker, general manager, Old Dominion Steamship Co., Pier 25, N. R., New York.

Calvin Austin, president, Eastern Steamship Corporation, India Wharf, Boston, Mass.

Starr Truscott, draftsman, hull department, American Ship Building Co., Cleveland, O.

Alexander F. Jenkins, president, the Alexander Milburn Co., Baltimore, Md.

Maximilian Byrstyn, commander, Austrian navy, naval attache, Austrian embassy, Washington, D. C.

Alexander H. Jeffrey, manager and secretary, Polson Iron Works, Toronto, Canada.

William B. Robins, draftsman in office of inspector of machinery, U. S. navy, Cramps' Shipyard, Philadelphia, Pa.

William G. Gustafson, draftsman, Pusey & Jones Co., Wilmington, Del.

Reginald E. Gillmor, mechanical and electrical engineer, Sperry Gyroscope Co., 74 Broadway, New York.

Charles A. Christoffers, treasurer, Amalgamated Paint Co., 42 Broadway, New York, N. Y.

David C. Howard, president, DeLaney Forge & Iron Co., 300 Perry street, Buffalo, N. Y.

Newman Page, draftsman in charge of mechanical department, Electric Boat Co., Groton, Conn.

Stevenson P. Taylor, assistant engineer, Alberger Pump & Condenser Co., 123 West Eighty-fifth street, New York.

Junior to Member

Francis J. French, engineer, the Jahncke Navigation Co., New Orleans, La.

Frank E. Bagger, lieutenant, Revenue cutter service, Washington, D. C.

Dayton E. Herrick, engineer, Mosher Water Tube Boiler Co., Ossining, N. Y.

Charles W. Hubbell, production engineer, the Seymour Mfg. Co., Seymour, Conn.

William J. Norton, secretary, National Electric Light Association, 429 Home Insurance building, Chicago, Ill.

Jerome C. Hunsaker, assistant naval constructor, navy yard, Boston, Mass.

A. de Bretteville, manager, Main Street Iron Works, San Francisco, Cal.

Junior to Associate

Harry A. Musham, lieutenant, United States army, 421 Rush street, Chicago, Ill.

Juniors

Louis A. Baier, draftsman, 615 East University avenue, Ann Arbor, Mich.

Frank A. Track, draftsman, lighterage department, Standard Oil Co., 26 Broadway, New York.

Joseph J. Kam, draftsman, Electric Boat Co., Groton, Conn.

Albert Hoersch, hull draftsman, Electric Boat Co., Groton, Conn.

Walter Defriez Allen, computer, Electric Boat Co., Groton, Conn.

Revere Burnham Pulsifer, assistant in naval architecture, Massachusetts Institute of Technology.

The Great Lakes Engineering Works has taken an order for the construction of two dredges for use on the Pacific coast. They will be shipped to the coast in a knocked down condition to be assembled at the yard of Joseph Supple, Portland, Ore.

The steamer John Duncan, owned by H. J. Pauly, Milwaukee, Wis., and the steamer Pueblo owned by F. W. Smith, of Milwaukee, have been sold to Montreal parties.

John H. Dialogue & Son, Camden, N. J., have delivered a harbor tug to the Moran Towing & Transportation Co., of New York.

Fulton and Froude

Results of Experiments in Towing Made at the Massachusetts Institute of Technology

THE first paper to be read was "Experiments on the Fulton and the Froude," by Prof. C. H. Peabody of the Massachusetts Institute of Technology. The character of the paper is indicated in the following paragraph:

The objects of the experiments related in this paper are the investigation of the characteristics of tow-boats and the determination of favorable conditions. The applicability of steamboats for towing was so evident that forms and proportions were settled early in the history of steam navigation, being controlled, in part, by the ideas then prevalent concerning the action of screw-propellers and in part by the conditions of service which required simplicity and reliability in the hands of men economically available for boats of that class. The conditions of the service favor conservatism, and consequently the early types have been generally preserved, though there are instances of progressive designs that have broken away from tradition, especially for large seagoing tow-boats. The propellers used for two-boats have habitually been four-bladed, with large area and wide tips, and have had a large pitch-ratio, commonly from 1.3 to 1.5. The pitch-ratio is controlled by the use of relatively slow engines, and the form of blade according to the old ideas concerning the action of screw-propellers, especially as applied to towing. Many designers have been of the opinion that both width of blade and pitch-ratio could advantageously be reduced and, when circumstances appeared favorable, have made such changes.

Built in the Shops

The Fulton was built in the shops of the Massachusetts Institute of Technology and the machinery and apparatus used on the Froude in 1911 were transferred to her. In reading the paper Prof. Peabody supplemented it considerably, saying:

The experiments reported last year on the Froude show that when running free, with a speed of seven knots and with a pitch ratio of 1.1, the power required is 8.3 H. P. With a pitch ratio of 0.8 the power required is 8.5 H. P. There appears to be some slight advantage of 1.1. Also the experiments made with a larger pitch ratio had a certain defect, which was only discovered after the experiment was finished, namely, the propeller was set a little nearer to the stern post. The result was some loss of efficiency. This does not affect our experiments on blade area and is of no particular consequence in this condition of running free, because all of the pitch ratio would not be used.

In order to exhibit the influence of pitch, we may turn to plate Fig. 4. Here we have three curves plotted upon one diagram with three axes for ordinates. You will note that there are three points to each curve, namely, triangles and crosses and circles. The circles are for the smallest pitch ratio. It appears that there is a slight advantage for the small pitch ratio in towing which, however, I am not desirous of claiming. It is enough to say, perhaps, that pitch ratio has perhaps but little effect on towing, and that the pitch ratio, as likely to be used for ocean-going tow boats, will not produce any appreciable effect on towing.

Tug Propellers

I think the reason why such a peculiar propeller is used in tugs in this country is the necessity for maneuvering, backing, filling, accelerating and retarding the movements in getting up to the tow and getting away from it, and also to the fact that until recently the majority of tugs were made of wood, and have ponderous stern frames and enormous rudders. Every one who has experimented with tugs knows of the tremendous influence that balanced rudders, made of broad wood, have on the propeller and the efficiency of the propeller, especially in towing.

A Member:—Is not that the width ratio?

Prof. Peabody:—The area ratio is shown on plate 4. There is shown both of the influences in the diagram. The area ratio I desire to dispose of once for all. There is a slight advantage in towing for the lower ratio, which does not distinctly appear on the diagram, but it can be discerned in the reading of the paper, if you compare the results from the diagram. The influence, however, is so slight that I have no desire to emphasize it, that is, one may use such area ratio as small as 0.5, without disadvantage, doing any of the services of the boat, and that pitch ratio may vary within a range which is likely to be used, without disadvantage, especially, perhaps one may say, with a tendency to use internal combustion engines and high speed of rotation. There is probably no disadvantage in towing on account of the smaller pitch ratio which will be associated with that condition.

On the next plate, No. 5, you will find given also the thrust. You will remember, perhaps, that the thrust was measured by a mechanism which gives very direct and positive results and which I believe may be accepted with confidence. There seems to be a very considerable advantage in pulling, with a small pitch ratio, on both of the boats, the Froude and the Fulton. Here we have but 7 H. P. the pulls for the various pitch ratios, 0.8, 1.1 and 1.5, running in the order of 400, 350 and 300, that is, the small pitch ratio has a very distinct advantage. This advantage of the pitch ratio of 1.5 I think is somewhat exaggerated in this case, from the fact that the propeller was a little too near the stern post.

Plotted the Revolutions

Now, on plate 7 we have plotted upon the revolutions per minute the power, the thrust with and against the wind, and the speed with and against the wind. There were at all times during our trial very moderate breezes, but when a boat has a speed of only 7 knots, you will see that even a very moderate breeze may have some effect. In order to avoid this effect, as stated last year, when necessary we did not hesitate to run very early in the morning. We are considering, if we continue this work, running in the evening when the weather conditions are more favorable. In that case we should have to light our course, light our ranges, which perhaps we may be able to do.

Plate 8 for the towing trial of the Fulton, and Plate 9 for the pulling trial of the Fulton, I call particularly to your attention, because I wish to claim a very satisfactory condition obtained in our results as shown by the way in which the points are distributed and the accuracy with which they lie upon the curve which we have drawn. Of course, our conditions are favorable to just this kind of result.

Let us turn to the next plate, 10, "Running Trials of the Fulton." Here you will see that we have stated in terms of brake horsepower on speed, thrust on speed, and calculated resistance from the towing of the model. These several curves are pitch ratios of 0.8, unity and practically 1.3. When running free the smaller pitch ratio has a disadvantage,

which can be represented in this order: With pitch ratios of 1.3, unity and 0.8 and with 11 brake H. P., the speeds attained appear to be 6.55 knots, 6.51 knots and 6.37 knots. Briefly let us say 6.5 for the full, 6.5 for the unity, and 6.4 for the smaller pitch ratio; the difference in some duties for tow boats being entirely of no consequence.

On the next plate, 11, you will find the so-called "Towing Trial." We have here again plotted down the speed in knots, the brake horsepower, the thrust, which is quoted for information, and the pull upon the tow line. The pull on the tow line, of course, at the same speed would be the same, because the tow is not affected by the conditions on the tow boat. You will note here that these three curves lie very close together. There is a slight, but a very definite advantage for the smaller pitch ratio.

Pulling Trials of the Fulton

On plate 12 we have the pulling trials for the Fulton. We have here the scale for brake horsepower and the pull in pounds. This is the brake pull on the tow line as measured by a spring balance, under proper directions, to see that the results should be regular and that the delicacy of the spring should be sufficient for the purpose. Here with pulls at 11 H. P., with pitch ratios at 0.8, unity, and 1.3, and we have 560 at 0.8, then 545 for unity and 490 for 1.3, a very distinct advantage for the smaller pitch ratio. We have also pulls backing—in that case we could not measure the thrust. There is but little advantage lying, if anything, with the small pitch ratio, the pull backing being somewhat in the neighborhood of 0.6 of the pull going ahead. Incidentally, we tried some other matters, as on Plate 13, which is again called towing trial of the Fulton. In this case, the variant was the length of the tow line, and our habitual lengths being about two lengths of the tow boat, namely, the Fulton being 30 ft. long, we had about 70 ft. of tow line out. We ran the tow line out to various lengths, from 70 ft. up to 200 ft., and it appeared that there is an advantage of about 10 per cent in having a tow line which shall be 6.5 times the length of the tow boat, instead of something more than twice the length of the tow boat.

Plate 15 represents the results of towing with the Fulton alongside the Froude, the habitual way of handling ships in narrow waters. In that case there would be an advantage of about 10 per cent.

Now, I want to conclude with statements which I think will be of the greatest importance, next to that perhaps of disposing of the question of the use of extraordinary forms of propeller, which has come down from olden times, and that is the question of design. I want to preface it with saying that we were unable for this meeting to analyze our trials so as to determine the weight. We have the material for it, the analysis will be made, and I hope to have the privilege of presenting that to the Society. We have also in our possession experiments upon propellers quite similar to this, used on the Fulton, but 12 in. in diameter, which were tested at the model basin at Washington, up to very large slips. When this work is reduced it will be possible to approach the design of a propeller for the tow boat when towing in the same way that it can now be done when running free.

John Reid:—The only reason that I am before you is that I think Prof. Peabody's conclusions are sometimes erroneous. I would like to call attention to the extraordinary statement which Prof. Peabody has made, and that is that from his experience with these experiments the internal combustion engine can be fitted into a tug and that the consequent high revolutions of the propeller would have very little effect upon the efficiency of the boat as a tug. I have had a little experience with that in the last twelve months, and I can inform Prof. Peabody, so far as my experience goes, he is hopelessly out of it. It all depends on what you expect a tug to do. As a branch of naval architecture the designing of tow boats would be a specialty for any man, no matter how clever. If you go to Europe, to Germany, to Holland, to Canada, you will find the tugs are utterly different, and that they are used in entirely different ways, and if you attempt to take a British tug and use it in America or a Canadian tug and attempt to use it somewhere else, you will have lots of fun on your hands. I have tried it and know.

Experience In the Paper

I was prepared to have any of my statements objected to and to take any castigation with the proper meekness of spirit, but if any man stands up and says we do not know what we are doing, because we are scientific, and he does know because his experience is contrary, I will say that there is more experience in this paper with regard to what you can do with towboats than almost any man has ever had for the reason that those people who have had long experience have had only one type of towboat which they could handle in the way in which it is designed, and could not do anything else with it.

I do not hesitate to say, so far as my experience in tugs has gone, and I have had about six built in Canada in the last few years, if you want to get assured success, you want to keep the revolutions somewhere around 120. If you get above that, you will get into trouble.

One of the troubles that any designer has to face in studying a paper like Prof. Peabody's is simply this: That, however he may agree with Prof. Peabody's findings, you cannot always convert them into practice, because you have got to take a certain size of hull, and get a certain size of engine, because the engineer has used that engine, and take a certain kind of propeller, because the man on board is familiar with it, and wants one with which he is familiar.

Peculiar Propellers in Tugs

I think the reason why such a peculiar propeller is used in tugs in this country is the necessity for maneuvering, backing, filling, accelerating and retarding the movements in getting up to the tow and getting away from it, and also to the fact that until recently the majority of tugs were made of wood, and have ponderous stern frames and enormous rudders. Every one who has experimented with tugs knows of the tremendous influence the balanced rudders, made of broad wood, have on the propeller and the efficiency of the propeller, especially in towing.

W. H. Hovgaard:—The experiments described in this paper will undoubtedly be of great value to the designer of towboats, but wish to draw attention to the fact that they will be of equally great value to the designer of ice-breakers.

As far as the propeller design is concerned, the two problems are about identical. In both cases it is required that the propeller shall develop maximum power under circumstances to where a great resistance reduces the speed to a very low figure.

I have had some practical experience in the design of ice-breakers and of propellers for ice-breakers, and it is a satisfaction for me to see that these experiments corroborate the opinion which I have always held and advocated, that the propellers of ice-breakers should preferably have a low pitch ratio. I met considerable opposition in this view of mine on the ground that the high pitch propeller shows up better on the speed trials in free water. It seemed desirous to me that a propeller which worked under the most favorable slip at full power and high speed in free water, can not possibly work to best advantage at nearly the same power when the speed is very much reduced, because the slips will then become excessive. With a low pitch ratio, a high number of revolutions, and maximum power may be maintained with good efficiency; i. e., a high thrust at even very low speeds.

Clinton H. Crane:—I think that all of us in this society have got to

appreciate a scientific investigation of any problem. I think all of us who have to do with the designing, building and handling of tug boats, realize that there is less information, scientifically, about a tug boat than about any other type of boat.

Steel Tug Boats

Some years ago we were called on to design a tugboat for the Brooklyn Eastern Terminal. They never used anything at all but wooden tugboats. There was a man in the place who would not have anything to do with a steel tugboat, because a wooden tugboat "towed better." He was asked "Why does a wooden tugboat tow better?" He replied, "I don't know, but I have been on the Smith, and know that she is better than any towboat in the harbor." I made a great many trips on the wooden towboats and looked in the steel towboats, and we finally built a steel towboat. When that towboat was finished none of the men in the yard thought that she was doing work equal to any of the wooden boats. We said, "All right, let us run a comparative test and let us see what the boats will do." We did so, and found that the steel towboat was doing 10 per cent more work than any of the other boats, but, all the same, old shell backs were not convinced. My experience with towboat propellers is that the general idea is that unless you put on a square tip, high pitch ratio propeller, it is no good. I have personally been convinced for a long time that a low pitch propeller would tow better. It is absurd to use a slip of 60 or 70 per cent when you do not have to, and yet the times when we put on low pitch ratio propellers, and we tried them several times, they have never been a success. It is perfectly fair to say that a low-pitch ratio will not handle the boat as well as a high-pitch ratio. It will not get the power to her as well, nor stop the boat as well, nor turn her as well—just why that is I have not been able to determine to my own satisfaction, and I rather hoped that Mr. Peabody, in his experiments, had made some handling experiments which would help us in that analysis.

W. T. Donnelly:—As to this matter of handling, when the tow boat is started up, there is a surplus of power. The engineer and the captain may not realize it, but the boat has been storing power, and I call attention to the fact that all of these tests given by Prof. Peabody show an economy relative to the power used. The captain has no sympathy in the matter of saving power, particularly when he is starting up, or doing other work, and while his propeller may be very much more inefficient, it may be a more serviceable instrument for that time, when he can disregard all questions of economy, and look only for questions of securing a given result.

As has been said by the last speaker, there is no question but what a large pitch handles the boat quicker and better. We can understand that readily, because it will absorb much more power for handling a larger quantity of water in a short time. There is certainly no question that as engineers we must weigh and measure to determine the units we are using, so as to predict a given result. We cannot predicate a result on the experience of any one man.

C. H. Peabody:—I was prepared to have any of my statements objected to and to take any castigation with the proper meekness of spirit, but if any man stands up and says we do not know what we are doing, because we are scientific, and he does know because his experience is contrary, I will say that there is more experience in this paper with regard to what you can do with towboats than almost any man has ever had for the reason that those people who have had long experience have had only one type of towboat which they could handle in the way in which it is designed, and could not do anything else with it. We can do anything we please with our towboats. Consequently, with these model towboats we have been able to have experience which nobody else has had at all; and it is experience, not scientific work, in a certain sense. Any one who says a thing will not go should be able to present experience to the contrary. If it is said that 300 r. p. m. will not do and 120 r. p. m. must be taken, I wish to say until it is proven that some one cannot use 300 r. p. m. and make a boat which will handle just as well, and perhaps better, the first statement must be held in abeyance.

Maneuvering in Narrow Waters

As for maneuvering in narrow waters, and as to whether a slow revolution will maneuver better than a higher revolution, we have not any information on that point. I believe the reason why a high area pitch ratio boat handles better is because the engine is a slow engine, and if it runs away it will not run away hard enough to hurt anybody.

I am glad to find that from his txperience, my colleague, Capt. Hovgaard, is in favor of the low-pitch ratio. I will say that we have taken a lower pitch ratio than we probably would ourselves advise any one to use, as we desired to cover the range so as to take in the entire field of inquiry.

I find that the statements by Mr. Crane, which I most heartily appreciate, are somewhat along the lines of what has been told to me by certain towboat men, that they will take off one wheel at the solicitation of the towboat captain and put on another wheel, and that he will report that the boat is doing very much better. I have known of an instance where they took off a wheel and put it back again, and the towboat was said to be doing very much better.

Traffic of Suez Canal

The traffic of the Suez canal last year showed an increase of 1,742,896 tons as compared with 1910, and an increase of 2,917,267 tons as compared with 1909. The gross receipts last year were the highest yet recorded—viz., $26,950,000, as compared with $26,080,000 in 1910, and $24,125,000 in 1909. Last year's increase is rendered all the more remarkable by the fact that some reduction in transit dues was made during the 12 months. The number of vessels which passed through the canal last year was 4,969, as compared with 4,533 in 1910, and 4,239 in 1909. Of these vessels, 3,089 in 1911, 2,778 in 1910, and 2,561 in 1909 carried the British flag. The tonnage of German vessels has also increased from 2,381,681 tons in 1909 to 2,563,749 tons in 1910, and to 2,790,963 tons in 1911. The average time occupied by vessels passing through the canal last year was 17 hours, one minute, as compared with 16 hours, 54 minutes in 1910. The proportion of vessels navigating the canal by night as well as by day last year was 96.4 per cent, as compared with 97.8 per cent in 1910. As from Jan. 1, 1913, the transit dues imposed on vessels passing through the canal will be reduced to 5s per ton for loaded ships, and 3s per ton for vessels in ballast.

The Fore River Shipbuilding Co. has received contracts to build two steel railroad car floats and three steam trawlers. The floats are for the New York, New Haven & Hartford Railway Co., and the trawlers are for the Bay State Fishing Co., of Boston.

The steamers H. P. McIntosh and Gen. George A. Garretson, of the Gilchrist Transportation Co.'s fleet, have been sold to the Wilson Transit Co., of Cleveland, for a consideration of $450,000. They were built in 1906, and are 550 ft. over all, 530 ft. keel, 54 ft. beam and 31 ft. deep.

Barge No. 83, building for the Standard Oil Co., was launched from the Cleveland yard of the American Ship Building Co., on Nov. 9. The barge is 260 ft. over all, 250 ft. keel, 43 ft. beam and 23 ft. deep, having capacity for 1,000,000 gallons of oil.

Bureau of Construction

Naval Constructor Robinson Describes the Methods of Handling the Work of Design

THE second paper to be read was "The Design and New Construction Division of the Bureau of Construction and Repair of the Navy Department," by Naval Constructor R. H. Robinson. The paper dealt only with the methods of handling an organization engaged in design and in passing on matters of new construction, leaving the work produced to speak for itself.

Joseph H. Linnard:—On page 23, of his paper, Mr. Robinson remarks, "One of our most difficult problems arises from that fact that until our naval bill passes we never know what the program for the year is to consist of." Many of the members of this society may be unaware that for several years past every naval appropriation bill providing for an increase of the navy has at the same time contained a positive prohibition against using any of that money appropriated for the increase of the navy for the design of the vessels. It is in connection with other appropriation bills, limited to a specific fixed sum, which has not been increased in any material way for a number of years, that the number of employes, both draftsmen and clerical, who can be used in the navy department in Washington are fixed. As you all know, the work devolving upon the navy department in connection with not only the designing of ships, but the running of them and their management, has enormously increased in many years past, and the problem that Mr. Robinson and others has been up against has been how to accomplish this greatly increased work with the same force of draftsmen and clerical employes.

Studying of Processes

As Mr. Robinson has explained in his paper, success has been reached through the employment of methods, the studying of the processes of work, which have been frequently called by that much abused term "scientific management," but this is a case in which the management and arrangement, and studies which have been made in the work, which have produced such remarkable results, have been made with the same working force, so that the criticism sometimes made against "time studies" and others, that while reducing in certain directions it brings in additional employes of one kind and another which offset the saving supposed to be made, cannot apply here, because we have not been able to increase the force, and therefore, I thought I would make it clear to you that these studies to which Mr. Robinson referred, have produced more work with the same force of employes, and therefore they could not be considered otherwise than as a success.

Homer L. Ferguson:—Mr. Robinson very modestly says that he would leave the results of the work which he has been doing in Washington to be judged by others. This question which he has brought up and discussed has particular interest to people in our business, I take it, in two ways; one is in the results produced, which have been most excellent. I do not think there is any draughting or office force in this country, either in the government service or outside which in efficiency and in promptness and in actual knowledge of what they are doing exceeds that of the force under Mr. Robinson, and those of us who do business continually with various governmental departments and with various organizations outside know that work which goes there is dealt with most promptly and most effectively, and if you get turned down it is done emphatically and at once without holding you up for a long time. I think that the results in that direction have been very remarkable, and I regret to state, in a way, that most of them have been accomplished since Mr. Robinson succeeded me in the job.

Room For Improvement

As indicating what can be done with an office force, I think it is very instructive to any one who is interested in scientific or common sense, or any other form of management which, of course, is what all of us who are trying to manage something should continually try to do — we should try to do things in an easier and better way, and with more method, and in my humble judgment there is greater room for improvement in most offices, in most drawing rooms, than there is in most work. In my experience, my efforts at scientific management have usually been aimed at correcting the evil habits of some one outside of the main office, and I believe that is the proper place to begin.

Richard M. Watt:—Naval Constructor Linnard omitted one rather important phase of the subject, and that is to have appropriation bills made sufficient in size—they seldom vary in numbers or types of ships as was evidenced by the last appropriation bill, and as chief constructor, I desire to express my appreciation of the system which has just been described, for under the able administration of Naval Constructor Robinson, it is unquestionably producing results.

R. H. Robinson:—With regard to what Mr. Linnard said, I may say that we have one less employee now than we had ten years ago, so that his statement is correct. As a matter of fact, our money expenditure is the same now, but we have distributed the expense of one man over the balance of the force. The original reason I had in mind in preparing this paper was because I am very much interested in system, and while I have a very small force to organize and manage, I spend most of my spare moments in doing that, and I put it down here in the hope that in the years to come other people would give a statement of what they had been able to do. I believe there are two important parts of the engineer's business, one is the technical and the other is the managerial, and when I get tired of one, I turn around and do the other, and any information which may be contained in this paper is simply the result of the compilation of things which may be applicable to the case in point.

A Curious Case

The master of the Italian passenger steamship Principe di Premonte was recently fined for disobedience of the provisions of the passenger act of the United States, in that his ship was not provided with proper tables and chairs for the use of the steerage passengers. Capt. Demeniconi argued that the steerage passengers whom his vessel carried, being Italians, had no use for tables and chairs, as they preferred to eat their meals seated on the deck of the vessel. The court agreed that the master was right in his contention, but it held that the obligation of the act of congress was absolute, and that the law having been broken in that tables and chairs had not been provided for those who admittedly had not use for them, the defendant must be punished. And punished he was, with a fine of $10 and fifteen minutes' imprisonment.

The Kansas City Missouri River Navigation Co. is transforming its oil-burning steamers Kansas City and St. Louis into coal burners.

Engineering Progress in Navy

Capt. Dyson's Paper Evoked Extremely Lively Discussion Among the Members

THE third paper read was Capt. C. W. Dyson's paper on "Engineering Progress in the United States Navy". The points touched upon in this article, which provoked the widest discussion, were as follows:

(a) General character of the service which the vessel will be called upon to perform; whether she must keep the sea for long periods, cruising at speeds very much lower than her maximum speeds, or whether she will be called upon for very little slow cruising, but shall be held in readiness for dashes at high speed from a base to any threatened point.

(b) Greatest economy realized at the conditions under which she will be called This point is important, not only upon to operate. from the point of financial saving in reduced fuel cost, but in the greater case of fuel supply due to the decreased demands.

(c) Fuel capacity entailed by the demands of the service to which the vessel may be subjected.

(d) Ease of up-keep of the machinery, and degree to which the vessel, so far as machinery repairs are concerned, can be made self-supporting.

(e) Reliability of machinery when driven at high powers.

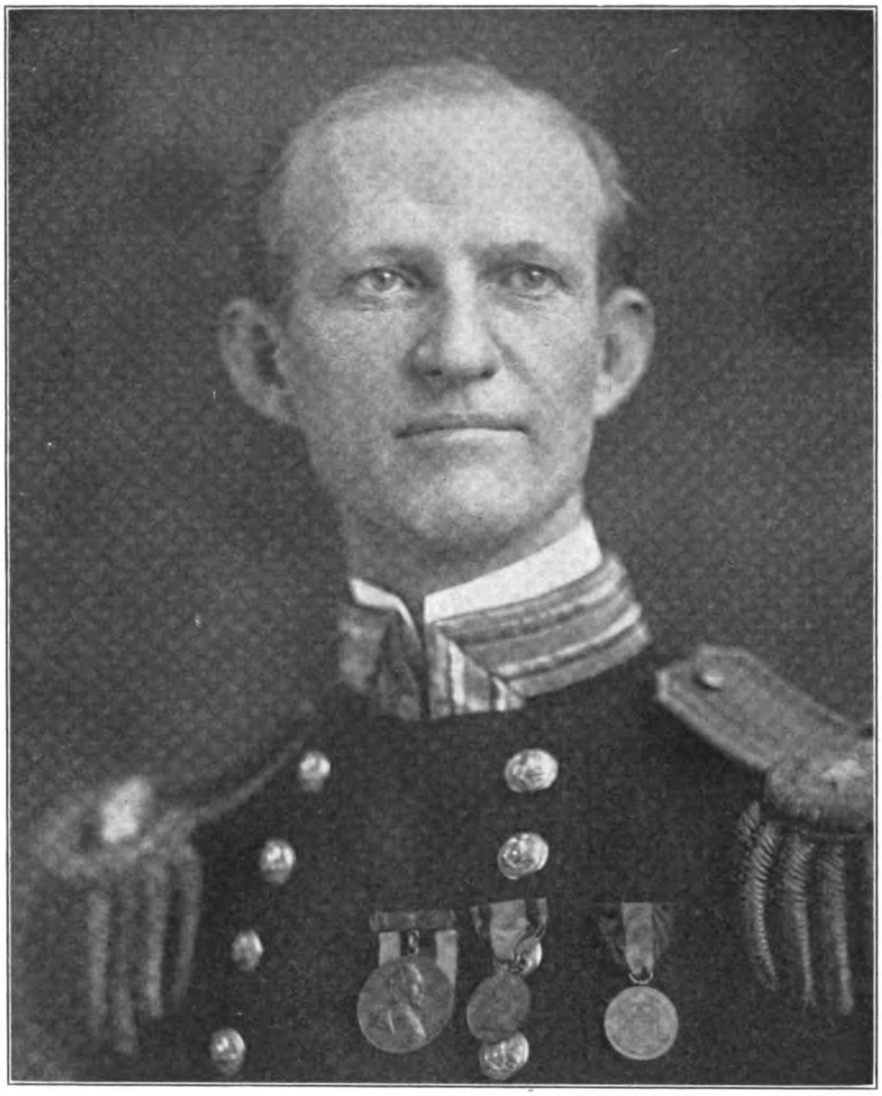
(f) Minimum weight and space required for the propelling machinery.

(g) Efficient propellers for maneuvering.

(h) Minimum of vibration of hull due to machinery in operation.

(i) Effect of vertical position of center of gravity of the machinery upon the time of roll of the vessel, in fixing the quality of the vessel as a gun platform.

Admiral H. I. Cone:—In connection with the statement, "This system, as applied to the destroyers, depends entirely for its gain upon the greater efficiency of the reciprocating engine at the higher steam pressures over the efficiency of high pressure turbined of the reaction and the high-pressure nozzles of the impulse type of turbines, no advantage being gained from increased efficiency of propellers, as the reciprocating engines are on the same shaft as the turbines. From some points of view this combination is undesirable, and the gain in service must be considerable to justify its retention." I do not know when this was written. Since that time that has been tried in service and it has met everything that was expected of it.



REAR ADMIRAL HARRISON I. CONE
Engineer-in-Chief United States Navy

Charles G. Curtis:—In view of the fact that every important nation except the United States is now building turbine battleships exclusively, and of the fact that the improvements of the last few years have been such as to cause the most responsible builders here and in foreign countries to put forward figures of low power economy on a par with the results shown by our reciprocating battleship, Delaware, the views expressed in Captain Dyson's paper just read are most interesting, and to me somewhat surprising.

With many of Captain Dyson's conclusions I heartily agree. I cannot, however, agree with his conclusion that the reciprocator is preferable to the turbine for the kind of battleship under construction—a view which is opposed to those of the best naval engineers in other countries.

In giving my reasons for the opposite view, I wish simply to put on record the facts and figures, stated as correctly as I am able to give them, realizing that whatever I may say on the subject will probably be regarded with more or less prejudice because of my connection with an interest in the matter. On this account I invite criticism, particularly from our navy department. On the other hand, Capt. Dyson has been the originator and developer of the most important improvements that have been made in marine engines in recent years. These improvements, though not generally appreciated, are all the more striking because of the belief long existing that progress in the direction followed by Capt. Dyson was not possible. Not only is

Capt. Dyson entitled to great credit for his important contributions to the art, but in view of his success it would not be unnatural if he should have a slight unconscious leaning towards the engine rather than the turbine.

Comparative Data

In Capt. Dyson's paper he compares the engine-battleship Delaware with the turbine battleship North Dakota, in regard to coal consumption, the former representing the type of engine which has been carried to our high state of development with remarkable results by Capt. Dyson himself, the latter representing a type of turbine which was new, and which had undergone practically no development at that time. When the North Dakota's turbines were designed—about six years ago, but little importance was attached to economy at low speeds. The builders were not asked to make any effort in this direction, and the turbines were designed simply to meet the actual guarantees called for by the department. These and the results obtained on trial were as follows:

WATER PER HORSE POWER INCLUDING SHAFT HORSE POWER OF MAIN TURBINES AND INDICATED HORSE POWER OF ENGINE ROOM AUXILIARIES.

	Guarantees.	Actual trial results.
At full power	15.1 lbs.	13.48 lbs.
At 19 knots	16.1 lbs.	15.37 lbs.
At 12 knots	23.2 lbs.	22.88 lbs.

The turbines thus met the guarantees in all respects, and were duly accepted. The excellent results at low speeds subsequently obtained by the Delaware which were largely due to the improvements introduced by Capt. Dyson were not then anticipated, at least so far as we know.

I have no doubt that Capt. Dyson used the North Dakota's results for comparison with the Delaware, because there is no other battleship equipped with this type of turbine in this country, and I have such faith in Capt. Dyson's fairness that I feel sure he had no intention of making an unfair comparison. Nevertheless, the comparison is, in my judgment, quite unfair, and should not be considered except in conjunction with the improvements that have been made since that time.

Last winter a battleship was awarded to the Fore River Co., which will be equipped with a more highly developed form of Curtis turbine, designed to give much higher economy under all conditions, particularly at low speeds. I believe, therefore, it will be illuminating to analyze the probable performance of this new ship, called the Nevada. Instead, however, of comparing one ship directly with another, which is always unsatisfactory where the models and the speeds are different, I will make the comparison between the old North Dakota and an assumed or new North Dakota, exactly like the old ship except that it is to be equipped with turbines and screws like those which are going into the Nevada. Such an improved North Dakota will be better than the old ship; first, because the turbines will be more efficient, that is, they will require less steam to develop the necessary shaft horsepower; second, because the screws will be more efficient for the reason that they are larger and slower turning, that is, they will require less shaft horsepower to develop a given speed of ship.

Plate (1) shows the actual water rate curve of the main turbines of the North Dakota at different speeds of ship obtained on the official trials, (no auxiliaries being included). It also shows the expected water-rate curve of the improved turbines for the new North Dakota under exactly like conditions except at low revolutions. It also shows the per cent gain in efficiency of the new North Dakota's turbines.

Plate (2) shows the number of heat units necessary to furnish the steam used by the turbines of the North Dakota and the engines of the Delaware. These curves are obtained by taking the actual water required by the main engines alone and multiplying by the total heat in the steam taken between the hot well temperatures and the initial temperatures. The auxiliaries in this comparison have been expressly excluded, because it so happened that in the case of the North Dakota the official trials were made with fewer auxiliaries than was the case with the Delaware. In order to make a fair comparison therefore, it is necessary either to exclude the auxiliaries or to assume an equal auxiliary consumption in both cases. I have thought it simpler to exclude them.

An Improved Dakota.

I will make the comparison between the old North Dakota and an assumed or new North Dakota, exactly like the old ship except that it is to be equipped with turbines and screws like those which are going into the Nevada. Such an improved North Dakota will be better than the old ship; first, because the turbines will be more efficient, that is they will require less steam to develop the necessary shaft horsepower; second, because the screws will be more efficient for the reason that they are larger and slower turning, that is they will require less shaft horsepower to develop a given speed of ship.

The third curve on plate (2) shows the heat units that would be required by the turbines of the new North Dakota operating under the same steam conditions as the old North Dakota. This curve is obtained by multiplying the product of the water-rates and the shaft horse powers for the new North Dakota by the same heat values as in the North Dakota. That is, the curve for the new North Dakota is based on the same initial steam conditions and same hot well temperatures as the curve for the North Dakota, and the improvement shown is due partly to the gain in turbine efficiency and partly to the gain in propeller efficiency. The improvement in propulsive efficiency has been assumed to be 10 per cent at all speeds. At the bottom of plate (2) is a curve showing the per cent excess heat units required by the Delaware over the new North Dakota.

It will be observed that the Delaware at 21 knots requires 18 per cent more heat units than the new North Dakota, at 18 knots 12 per cent more, at 16 knots 5 per cent more, and below 14 knots the consumptions are practically equal.

This means that the new North Dakota could either have her boilers cut down 15 per cent, or her turbines could develop 18 per cent more effective or push horse power with a given amount of steam. Allowing for an auxiliary consumption equivalent to that of the Delaware this increased horsepower would give the ship an increased speed of ½ knot. In practical working, however, the turbine, because of the fact that it can safely be forced much higher above its normal capacity than the engine, can utilize more steam and can therefore develop a great deal more horsepower. With such a steam generating capacity as our battleships are now provided with, the turbine ship could be driven at least a knot and probably a knot and a half faster.

Battle-Cruiser Princess Royal

In this connection, I draw attention to the *Scientific American* of Nov. 16, which states that the British battle-cruiser Princess Royal in her recent trials showed a mean speed over the measured mile of 33 knots, and a speed of 32 knots on the eight-hour full power trial. This is 4 knots above designed speed. This ship has a displacement of 26,300 tons, about the same as that of our last battleship, but is somewhat longer, being 660 ft.

Whether these curves are trustworthy or not depends, of course, upon whether the expected improvements in both propulsive efficiency and turbine efficiency will be realized. Regarding the first point, experience had with screw designs since those of the North Dakota were made shows that their design can be materially improved, even without changing the revolutions. I understand that new screws designed by the navy department have recently been tried on the North Dakota, and that the pre-

liminary reports show a considerable improvement in efficiency. The expected gain due to better design, combined with lower revolution has been arrived at after consultation with Capt. Dyson and his assistant, and I believe that the figures of gain assumed are regarded as quite conservative.

Concerning the expected gain in turbine efficiency, a fear has been expressed that sanguineness may have induced expectations that cannot be reached. In answer to this I will state the ground on which the expected improvements are based.

First. In the old North Dakota turbines there are 28 moving rows of buckets. In the new turbines there will be 97 rows, although the peripheral speed is somewhat less in the latter, the efficiency is certain, judging from previous experience with actual machines, to be much better.

Methods of Calculation

Second. The methods of calculation employed in arriving at the figures are founded upon constants which have been used extensively in this country and Germany, and also in England and France, and which have been shown to be reliable by application to many different types of turbines. The correctness of these methods has been confirmed by an immense practical experience in these countries with both the Curtis and Parsons turbines, including marine types.

Third. The results shown by a cruiser having turbines very similar in character to those under consideration, but of less horsepower, which were tested with great thoroughness during the builders' trials of the vessel several years ago. At 14.2 per cent of full power (corresponding with 12 knots) and a peripheral speed of 73.5 ft. per second, the expected water-rate in the case of the new North Dakota is 16 lbs. Under similar conditions, but at considerably lower peripheral speed, and with fewer rows of buckets, the cruiser turbines show a water-rate of 17.1 lbs. At the same peripheral speed, they would have shown a water rate fully as low as 16 lbs. The results shown by these cruiser turbines would of themselves seem sufficient to warrant full confidence in obtaining the results expected.

Fourth. Within the last year a number of large battleships have been ordered by some of the most advanced nations to be equipped with Curtis turbines of a similar character. In England a large battleship cruiser of 87,000 H. P. has recently been ordered fitted with Curtis turbines quite similar in character, and involving figures of economy quite as low relative to the conditions as those now proposed. As already stated, responsible builders have for some time been offering designs with assurances of economy at low power for battleships similar to that now under discussion, practically on a par with the figures shown by the Delaware.

Fifth. With four shaft arrangements still better economy can be obtained.

I do not mean, of course, to predict that the exact estimated figures will be obtained. Every experienced engineer knows that in a machine of this kind results may come out a few per cent one way or the other, but even if they should fall short of expectation by say 5 per cent of full power—or 10 per cent at low power, such a possibility can hardly justify discarding the decided advantages of the turbine due to its higher full power efficiency and its greater overload capacity and reliability, nor can it justify, it seems to me, the discouragement and set back in turbine development in this country which is bound to result if the next battleship is equipped with engines.

In my judgment the best form of propelling machinery for the next United States battleship would be straight turbines either in a two, three, four-shaft form, combined with small cruising geared turbines, which would be used only at low power, and on long cruises where economy was important. When these were in use the steam would pass first through the geared turbine, and then through the main turbines. A very large gain in economy, at least 25 per cent, can be had in this way at speeds in the neighborhood of 10 or 12 knots. The horsepower to be transmitted by each gearing would probably not exceed 700 or 800, and the art of turbine gearing has already reached a stage where the practical success of such an arrangement in a battleship is reasonably well assured. In England over 100,000 H. P. of geared marine turbines are built or building, and in this country a considerable number of geared turbines are now in operation, driving electric generators, and a much larger number are building. If any objection should be found to the geared turbines in service, they could be dispensed with, and the ship would still be a better proposition, all things considered, than if she were equipped with a reciprocating engine.

Curtis Turbines.

Within the last year a number of large battleships have been ordered by some of the most advanced nations to be equipped with Curtis turbines. In England a large battleship cruiser of 87,000 H. P. has recently been ordered fitted with Curtis turbines quite similar in character and involving figures of economy quite as low relative to the conditions as those now proposed. As already stated, responsible builders have for some time been offering designs with assurances of economy at low power for battleships similar to that now under discussion.

Holding Power of the Propellers

I entirely agree with Capt. Dyson that in all previous turbine vessels the propellers used have been altogether too small, and the result has been that in adverse conditions of wind, sea or ships' bottom not only does the efficiency fall off materially at high power, but the slip of the screws becomes so great that their holding power is quite inadequate. In our last battleship, the Nevada, arrangements have been made to use propellers having a disk area about 18 per cent greater than those of either the North Dakota or the Utah. I would, however, strongly advise using still larger propellers turning at a still slower speed. This would involve some loss in turbine efficiency, but it would be almost entirely made up by a gain in propulsive efficiency, so that the net result would be but little inferior to the present arrangement. Probably the difference would not exceed one or two per cent at full power and three or four per cent at 10 knots. This would give a much better and more manageable ship under all conditions not only in going ahead but in backing. On a ship like the Nevada, I should advise using propellers at least 40 per cent larger in disk area than those used on the North Dakota, and turning at not over 200 r. p. m. for full power.

The backing power, or more properly speaking, the efficiency of the turbines when backing, has in the case of the Nevada been largely increased over that of the North Dakota, so that this ship will undoubtedly be an entirely different proposition in this regard. With the steam flow equal to that used at full power ahead, and at 80 per cent of the full speed revolutions, the backing horsepower of the Nevada will be about 55 per cent of that developed at full speed ahead. Since a great deal more steam can be passed through the turbines than is possible with the engine, this can be increased at leat 50 per cent so that a backing power as high as 70 or 80 per cent can be obtained, for short periods—as long as the boilers can furnish the steam.

William L. R. Emmet:—In the discussion of methods of propulsion I want to take an annual opportunity of saying a word for the electrical method. In the last few months we have taken larger units for the collier Jupiter, being built at the Mare Island yard, and we have obtained from that generating unit the exact result which I predicted on it—was considerably better than what we

guarantee on the ship. During its completion, however, we have learned some things about turbines, and I have arrived at the opinion that we could get very much better results by certain changes, in a somewhat modified form, by retaining a portion of the turbine which we already had, that is, in putting the new low pressure end on it. That machine was tested last week, and it has given the best economy of any engine ever produced for any service. In over 5,000 lbs. output we have 72 per cent efficiency of saturated steam, and the water-rate of the Jupiter, although it is only 190 lbs. pressure, and saturated steam was 28.5 vacuum, will be 11.1, which I think is about at least 3.5 lbs. better than the best locomotive engine driven, especially under such conditions of steam.

Nine Rows of Blades

This machine, instead of having so many rows of blades, and all these things which have been spoken of here by Mr. Curtis, has only nine rows of blades, and its length is only a little over 4 ft. Its diameter is about 5 ft., it is an extremely small thing, any part of which can be handled and got at, and it is extremely simple, and its parts are large and rugged. In speaking of methods of propulsion, all that I enumerated is that due attention should be paid to the characteristics incident to the best propellers and also to the characteristics incident to the best turbine speed. This new turbine, the Jupiter, is a high speed machine, which runs at 2,000 r. p. m., and it is a very distinct advance in prime movers over anything ever produced before. The merit incident to the best propeller speed and also the merit incident to the best turbine speed, which obtains in this machine to which I have referred, should be carefully weighed as against the characteristics of other prime movers of different speeds, but it is the best we know how to do. With electrical propulsion, we select the best propeller speed, and there is a great difference in economy due to the best selection, as we all know, as has been shown on the floor of this meeting. The question is how shall we get these best speeds, and what can we afford to sacrifice in order to obtain approximations to them? With certain types of turbines you can produce very good results if the speeds are not too extremely low, that is, with certain improvements of speed in the existing marine turbine you can make it very much better, and the aim of Sir Charles Parsons and others who have worked intelligently on the theme of gearing to ships has been in the direction of, by a moderate and reasonable speed reduction, getting a very good turbine, at the same time, retaining a pretty good propeller speed. I have nothing in the world to say against this. I have experimented successfully on gearing a good deal myself, and I think that it is a very hopeful thing, but until we can have big enough ratios of speed reduction, it is not justified as compared with electricity, because the electrical equipment is extremely simple, extremely light, and has a high efficiency, which is perfectly well known and which is absolutely unquestionable.

The efficiency of reduction in the apparatus on the Jupiter is 92 per cent, that is there is 8 per cent loss of electricity. Now, if you study the curves of propeller performance, you will see that small concessions in the matter of propeller speed can be made without losing more than that. From such data as I have been able to obtain concerning gearing, I do not see how a ship like the Jupiter could be properly propelled, with proper propeller speed and turbine speed, unless you use double reduction, and double reduction is a complication. Therefore, my plea for electrical propulsion is that it gives you the rate of speed you want, something we know about, and you do not have to look into the future at all. I simply say that the propulsion of ships by the methods now used is absolutely not justified in the light of the performance the Jupiter has made, and that is a remarkable piece of apparatus, and the means of speed reduction are thoroughly well known.

Electrically Propelled Ships.

While it may appear to many that all this talk about the electrical propulsion of vessels is a waste of time, I just want to say that there is a great deal of attention being devoted to this subject and in spite of all contrary opinions that have been expressed, there will be a great many electrically propelled ships soon. The subject is being seriously considered by many large ship users abroad and is being more and more thought of here. It is a thing which should be considered simply on its merits, but if these merits were carefully considered I think they will be conceded to be rather large.

In the methods of electrical propulsion designs, which I have made, and which have been published in papers which I have read, they show certain equipments, which the developments of recent times has enabled us to considerably simplify, so that the electrical end of ship propulsion is simpler than it was when I wrote those papers. Means have been devised in connection with the driving of locomotives, in which we need a very wide torque in securing the necessary starting power. In running electric locomotives a method of designing alternating current motors has been developed which has a characteristic, by the use of induction in the rotor, of making the rotor so that it will give a high torque only out of synchronism with the generator and will give good efficiency when it is in synchronism. This gives us the quality which we need in ship propulsion. This rotor is so constructed that its windings present a high resistance to currents of high frequency and a very low resistance to currents of low frequency. When the motor is at a speed nearly synchronous with the generator the effective resistance of rotor winding is low and the motor is virtually as efficient as a motor of the ordinary type assigned for small full load slip. When the motor departs from the nearly synchronous condition, as in the act of reversing, the self-induction of the rotor winding causes the bulk of the current to change its path, and to act through channels of high resistance, so that a high torque is maintained, as would be the case if a considerable resistance were actually switched into the rotor circuit.

By that method we can use a motor without external resistance, and that is a very great simplification, because there are no connections to be made, and the ship can be operated by simply throwing switches without interruption of service. If I were re-designing the Jupiter equipment, I would have it arranged to be handled exactly as a locomotive is handled, by moving a little controller, so that I could stop the ship, or start her, or reverse her, and do everything that is necessary to be done through electrically controlled switches, and the opening and closing of those switches would be the only thing that would have to be done in connection with the whole manipulation of the vessel.

Many Electrically-Propelled Ships

Now, while it may appear to many that all this talk about the electrical propulsion of vessels is a waste of time, I just want to say that there is a great deal of attention being devoted to this subject, and in spite of all contrary opinions that have been expressed there will be a great many electrically-propelled ships pretty soon. The subject is being seriously considered by many large ship users abroad, and is being more and more thought of here, and it is a thing which should be considered simply on its merits, but if those merits were carefully considered, I think they will be conceded to be rather large.

Ernest H. B. Anderson:—I wish to thank the previous speakers for their remarks about gearing, because all the successful applications of turbine gearing have been carried out by Sir Charles Parsons, and our experience with geared turbines has shown remarkable economy of steam consump-

tion and great success has been achieved with two destroyers, two channel steamers and cargo boats. It may be of interest to you to know that there is upwards of 100,000 H. P. of Parsons geared turbine machinery built and under construction.

Walter M. McFarland:—Does the gentleman dispute absolutely the statement made in Capt. Dyson's paper, that the gearing on the Neptune is running successfully?

Ernest H. B. Anderson:—All I wish to say is that the successful application of mechanical gearing in modern vessels has been carried out by Sir Charles Parsons.

As regards a comparison between the trial results of Florida and Utah, I do not agree with the author that the efficiency of the propellers in the former ship fell off greatly, due to adverse weather conditions. To illustrate my meaning, I have plotted the trial trip standardization curves of speed and revolutions for both these ships. The two curves are very much alike. This is shown by Plate A.

Trial Trip Conditions

As you probably know, trial trip conditions vary so greatly that I do not consider it anything out of the ordinary that the Florida required more revolutions for the same speed, even though the propellers of both these ships are of the same dimensions. My opinion is that this difference is largely due to the finish of the propeller blades, and it is possible that the blades of Florida wheels are thicker.

In addition, Florida made new speed records for United States battleships, on the standardization trial 21.952 knots against Delaware 21.44 knots. Further, on the four-hour full speed trial Florida 22.08 knots against 21.86 knots for Delaware. Utah on final acceptance 21.92 knots for four hours, driving against a heavy breeze.

Plate 1 shows curves of I. H. P. and S. H. P. on a basis of speed for Delaware and three turbine ships. My view is that the shaft horse power figures are practically valueless, due to the fact that torsion meters are so erratic. Also, various types of torsion meters have been tried by the navy department, which accounts largely for so great a variation in S. H. P. data of turbine ships.

A more accurate method of comparison is arrived at by basing water consumptions of machinery on the effective horse power results obtained with the models of vessels pulled in the experimental tank. This was our regular practice before the advent of the torsion meter.

The curves on plate 2 are based on total water consumption of machinery "as measured" during the builder's trial trips. I do not consider that the Delaware and the Utah can be compared accurately on an equal basis in this manner. The following list gives the total steam consumption of the auxiliary machinery as recorded during the trial trip results of three ships, and for battleship Utah I have estimated the auxiliary from the turbine steam pressures, as the water consumptions of the main engines and auxiliaries were not separately measured.

Water Consumption Trials.

Auxiliary Machinery Data.—Pounds per Hour.

	4 hours, Full speed.	24 hours, 19 knots.	24 hours, 12 knots.
Delaware	40,557	30,512	23,457
North Dakota	26,512	43,791	25,240
Florida	67,352	56,382	41,843
Utah (estimated)	62,400	47,400	29,500
Wyoming	......	......	*42,200

*Approximate.

The figures given show greatly in favor of Delaware.

I have tabulated the auxiliary steam consumption of the scout cruisers at three different speeds, which shows that the auxiliary steam consumption of a turbine-driven ship, and a reciprocating engine ship are about alike.

Water Consumption Trials.

Auxiliary Machinery Data.—Pounds per Hour.

	10 knots.	20 knots.	Full speed.
Chester	13,752	24,303	40,025
Birmingham	11,809	21,162	41,551
Salem	14,601	22,907	46,003

It is rather curious that the auxiliary steam consumption of Delaware and the scout cruisers at full power are about alike, although the Delaware requires 50 per cent more indicated horse power under this condition. I fully believe that the only way to arrive at a true comparison between Delaware and the Parsons turbine-driven ships, is to send them out together for runs at cruising speeds, on conditions similar to scout tests, or preferably burning oil fuel only.

As regards Curve D, this is hypothetical.

The total coal consumption figures actually recorded on the builders' acceptance trials are of interest.

Coal Consumption Trials.

	Knots.	Coal Consumption, tons per 24 hours.
Delaware	21.56	578
Utah	21.042	468
North Dakota	21.64 (3 hrs.)	583.20
Delaware	19.217	319.20
Utah	19.225	283
North Dakota	19.21	292.50
Delaware	12.24	111.80
Utah	12.018	118.75
North Dakota	12.04	106.20

I have plotted a curve (see Plate B) of speed and total coal consumption in lbs. per hour for Delaware and Utah. At 21.0 knots speed for Delaware and the corresponding speed of 20.82 knots for Utah; Delaware burned 1.14 times as much fuel as Utah, but at 12 knots speed for Delaware corresponding to 12.17 knots speed for Utah, the latter burned 1.12 times as much fuel as former.

Another point of interest, the basis of the contracts for the machinery of these ships was different in each case. Delaware, coal measurements, i. e., pounds of coal per I. H. P. of the main engines and engineer's auxiliaries, whilst in Utah, the contract was based on water consumption in lbs. per hour for turbines and all auxiliaries per S. H. P. of the main engines only.

Dealing with the question of breakdowns, I have been under the impression that reciprocating engine ships do go regularly to navy yards for repairs. Newspapers have reported within the last year that Idaho, Mississippi, Nebraska and Connecticut have required the services of a navy yard to make repairs to the propelling machinery.

As regards breakdowns of turbine-driven ships, only two of these causes are applicable to the turbines of Parsons reaction type.

Blade Stripping

Practically all troubles of this nature have occurred in cruising turbines, and my opinion is that they are largely due to making the blade tip clearances too fine. We have aimed for getting maximum economy, when it is just as essential to have naval machinery free from any possible chance of machinery breakdown. Blading troubles with the main turbines are very rare. When they do occur it is usually after opening up the turbines for inspection. The men who do this overhaul work do not realize the absolute necessity for taking proper precautions to see that no foreign materials are left within the casings.

Rotor corrosion simply means a question of personal supervision down in the engine room, and if instructions are faithfully carried out this will not happen. In the turbines of a battleship, rotor corrosion means neglect; for the interior of every rotor can be thoroughly examined by removing manholes on the casings and internal examinations should be made periodically. There have been one or two bad cases of rotor corrosion in the navy, which have been largely due to neglect. On the other hand, there are many turbine-driven ships in the navy which have had absolutely no trouble in this respect.

As regards reliability, take the engines of the scout cruisers, recall the full speed trials of these ships when they were practically new:

Birmingham made 24 knots, but it was found advisable to shut down at the end of 12 hours, and this ship returned to the navy yard for repairs.

Chester, with Parsons turbines, 25.08 knots for 24 hours.

Salem, 24.32 knots for 24 hours.

Dealing with the somewhat vexed

question of comparative machinery weights and engine room spaces, I have extended the author's list and carried the comparison on to the latest battleships now under construction. In each case, I have first of all given the designed figures, or the basis of all calculation. Note that the displacement of each class of ship has steadily increased.

	Delaware.	Utah, Florida.	Arkansas, Wyoming.	Texas, New York.	Oklahoma.
Designed displacement	20,000	21,825	26,000	27,000	27,500
Contract speed, knots	21.00	20.75	20.50	21.00	20.50
Type of engine	Reciprocating	Parsons turbines		Reciprocating	
I. H. P. design	25,000			28,000	24,800
S. H. P. design	23,000	28,000	28,000		
Engine room					
Length, ft.	44	60	60	60	60
Mean width, ft.	50.50	51	52.50	53.50	58
Total area in sq. ft.	2,222	3,060	3,150	3,210	3,480
Shop weights, gross tons.......	654.50	659.01	648.23		

WEIGHTS INCLUDED ABOVE, AS FOLLOWS.

Delaware.

Main engines and lagging
Throttle valves and fittings
Forced lubrication casings on engines, pipes and tanks
Exhaust pipes to condensers
Two condensers, each 11,788 sq. ft. C. S.
All shafting; spring bearings and stern tube bushes
Propellers and nuts
Air and circulating pumps.

Utah and Wyoming.

Turbines and lagging
Turbine regulating valve and pipes, all valves and pipes between turbines
Forced lubrication system
Tanks and coolers
Exhaust bends to condensers
Two condensers, Utah 15,225 sq. ft. C. S. each; Wyoming 14,308 sq. ft. C. S. each
All shafting and spring bearings and stern tube bushes
Propellers and nuts
Air and circulating pumps
Vacuum augmentors for Utah.

As regards the total weight of the engine room fittings of Delaware and Utah, I do not consider they should be compared on an equal basis, as this is unjust to the turbine-driven vessel. I have, however, taken the actual shop weights of Delaware and Utah and confirm the latter from Wyoming, a still larger vessel, on what I consider to be an equal basis, and my figures show that the weights are about equal in the three ships, if anything in favor of turbine machinery. I cannot reconcile the weight given for Utah.

The machinery weights of Oklahoma will be much greater than Delaware, for the reason that there are four condensers, four sets of air pumps, four sets of circulating pumps, and much longer pipe connections, etc.

Again, the machinery spaces in the three scouts are alike, and the following list gives the total machinery weights of these ships, which shows clearly that the advantage lies with Chester.

Total Weight of Machinery Including Water.

	Type of engine.	Weight, tons.
Chester	Parsons turbines.	801
Birmingham..	Reciprocating engines.	844
Salem........	Curtis turbines.	909

As regards the engine room floor areas, it is of interest to note that Delaware is not being repeated.

There is one special feature I want to draw attention to, in connection with a comparison between reciprocating engines and turbines, *i. e., lost water or make up feed water.*

This loss has never been checked on a battleship trial; in a reciprocating engine, it amounts to a very large quantity at the higher speeds.

Coal Consumption Trials.

	Knots.	Coal consumption, tons 24 hours.	Make up feed water, tons per day.
Chester	*10.03	42.06	10.97
Birmingham .	* 9.86	32.14	10.10
Salem	* 9.90	53.85	11.66
Chester	†19.90	162.90	17.51
Birmingham .	†19.83	153.45	26.10
Salem	†20.25	202.03	16.80
Chester	25.08 24 hrs.	429.40	27.00
Birmingham .	24.00 12 hrs.	375.72	120.00 Leak in receiver pipe.
Salem	24.32 24 hrs.	415.15	45.63

*Test 96 hours.
†Test 98 hours.

This list gives the water losses in the scout cruisers on three trials.

At low speeds, slightly in favor of reciprocating.

At one-half and full power the losses in reciprocating engine very great over that of turbine-driven ships.

I would refer you to Janes' "Fighting Ships," 1912 edition, for an article on "Progress of Warship Engineering," which compares two Italian battleships, San Giorgio with reciprocating engines, San Marco Parsons turbines.

As regards the question of maneuvering, there are over 44 shaft turbine-driven battleships and battleship cruisers now being handled successfully and easily. I do not consider the backing tests made during the builder's trials any criterion. In every case we have been very cautious about stopping the engines, and there is no question but that this can be done in very much quicker time with absolute safety to the machinery. The astern turbines are designed to develop 55 per cent of full ahead power with the same quantity of steam.

In the case of the destroyers, on the builder's trials of the vessels finished this year, the backing tests were carried out practically twice as quickly as they were originally, and it was a matter of special comment on the way the boats stopped, when put full speed astern, going 29½ knots ahead. This will apply in similar way to battleships.

As regards the choice between reciprocating engines and turbines for battleships, I do not consider that the navy department has ruled in favor of reciprocating engines, for in the two battleships recently awarded, one is being fitted with reciprocating engines and the other with Curtis turbines.

Another point that should not be overlooked, give the engineers time to know and understand this new machinery. For instance, it is new to practically every man on your latest battleships, Wyoming and Arkansas, and I know none of them have been shipmates with turbines before.

As regards economy at cruising speeds, from all accounts the ships of Atlantic fleet are now cruising at speeds varying from 14 to 16 knots regularly, and under such conditions I feel certain that the turbine ships will compare equally as well, if not better than, the reciprocating engine ships.

Your latest battleships are now being equipped solely for burning oil fuel under the boilers and to my mind the only possible solution in such a case is:

Turbine machinery, this has been proved conclusively in the destroyers.

The question of economy at the low cruising speed of 10 knots will now have to give way to a much more important one, namely economy at the higher speeds. With a four-shaft turbine installation it is possible to get at least 2 knots more out of the vessel, without any undue strain on the machinery. I do not believe such a condition is possible with reciprocating engines. Further, there is only a very remote possibility by which turbine engines of a four-shaft turbine battleship can be put *hors de combat.*

Combination Steam Engines

As regards a combination of reciprocating engines and turbines in battleships, "if" this is again proposed, I would suggest that the turbines be placed on the outboard shafts, which would get over the difficulty the author refers to, regarding the efficiency of the turbine wheels. It may interest you to know that this arrangement of machinery has proved exceptionally economical on larger merchant ships of moderate speed. Some of these ships have three shafts and others have four shafts. I do not, however, consider it suitable for a battleship.

Many improvements have been made in Parsons turbine machinery both in respect to improving economy and also, of just as much importance, less liability to breakdown.

First. Blading is being made more rugged by fitting two binding strips to the longer blades in place of one.

Second. Radial dummies will be fitted in L. P. turbines of battleships, avoiding all adjustments.

Third. Greater attention is being

paid to fitting auxiliary exhaust nozzles where they will give the best results, but I should like to mention that these connections were fitted and used on the Chester.

Further, it should be borne in mind that the Parsons turbines of the four battleships now completed, have machinery installations which were designed in 1908.

Two destroyers fitted with Parsons reaction turbines of the latest design are now being built at the Bath Iron Works and these designs contain many improvements over the earlier type. The machinery arrangement is entirely novel for destroyers, and I feel confident in making the statement that these ships will be the most economical throughout the whole turbine world.

Dealing with the present destroyers, of which there are 20 of practically the same design in commission, I consider the speed results, obtained with these three shaft vessels, remarkable. The machinery was designed to develop 12,000 S. H. P. at a speed of 29.50 knots. Many of them are able to do and are being forced along at speeds varying from 32 to 33 knots, which means that the turbines are developing upwards of 18,000 S. H. P. at a speed of 29.50 knots. In justice of the turbines I think this is a very unsatisfactory state of affairs. It simply means that the life of the whole machinery installation is being shortened. Further, there is always a grave danger of an accident, due to excessive steam pressure. If 33 knots is required, build vessels designed to do this. Builders' trials are an entirely different question, more men are usually on duty at one time and a greater watch can be kept on the turbine bearings.

Further, on a ship in commission, the displacement is usually greater than with a ship on a builder's trial trip. The remedy is simple, and it is a very easy matter to arrange conditions in the engine room so that the engineers on watch cannot get more than 30½ knots out of these ships.

Doing Better Than Delaware

Charles F. Bailey:—I was very much interested in the paper presented by Capt. Dyson, and possibly being an employee of the Newport News Shipbuilding & Dry Dock Co., you may expect me to refer especially to the Delaware. I do refer especially to the Delaware in this particular, that three weeks before the bids for the proposed battleships Texas and New York were opened, we were at the office of the bureau of steam engineering and discussing with Admiral Cone the possibility of his considering a bid for a reciprocating engine propelled battleship. He asked us if we could do as well as we did in the Delaware, and we informed him we could do better, and we are attempting to do that.

It seems to me that the question of the reciprocating engine, and the revival of the use of the reciprocating engine in the navy, with forced lubrication, is significant at this time, in view of the development which has taken place in the Diesel or internal combustion engine. You know these engines are using forced lubrication, and by this means the engineers are able to run them without giving the usual attention to lubrication which is common to reciprocating engines. By the adoption of Diesel engines, or internal combustion engines, in conjunction with other steam propelled engines, it seems that a large economy can be effected at the lower powers. As you are probably aware, many of you, the European powers are now building battleships with engines of the internal combustion type for cruising. The other screws are propelled by turbines. I admit it is probably not practical to install the immense powers to which we are probably going in the battleships and cruisers in reciprocating engine units. Therefore, the turbine engine is best adapted to those, especially if the vessel is an oil-burning engine vessel, it may be noted that the Diesel engine would be fitted, and is being fitted in several vessels in Europe for cruising. One remarkable thing that is apparent in the Diesel engine is that at low power the fuel economy is nearly as good, for horse power, as it is at the higher powers. By this method the cruising radius of the battleships can probably be more than doubled. I am not aware that we have yet made attempts on this side to install this type of engine or propelling machinery in ships of the destroyer type, or cruiser type, or battleship type. Of course, they are being installed in some submarine types, but it is my opinion we shall soon turn our attention to using the internal combustion type of engine, probably in conjunction with turbines, for the large powered ships.

Parsons Turbine Machinery.

Many improvements have been made in Parsons turbine machinery both in respect to improving economy and also of just as much importance, less liability to breakdown.

First.—Blading is being made more rugged by fitting two binding strips to the longer blades in place of one.

Second.—Radial dummies will be fitted in L. P. turbines of battleships avoiding all adjustments.

Third.—Greater attention is being paid to fitting auxiliary exhaust nozzles where they will give the best results, but I should like to mention that these connections were fitted and used on the Chester.

R. C. Monteagle: — This paper, though brief, is an admirably clear presentation of engineering progress in the navy, and in reading it one cannot escape the conclusion arrived at by the bureau of steam engineering, viz.: that of placing reciprocating engines in heavy vessels of comparatively moderate speed.

Increase of Steam Pressure

The supplanting of steam-driven reciprocating engines is not imminent, nor do I believe such will be the case, until every means has been exhausted to increase the efficiency of reciprocating engines, reduce their weight, and the space which they occupy. The various means of increasing such efficiency have not been exhausted, and the direction which I believe to be the most important, in which improvements to reciprocating engines is to be found, has been neglected. I refer to the increase of steam pressures. By increasing steam pressure, we at once have (with correct engine and boiler design) increased economy, reduction of weight, and reduction of space occupied by machinery and fuel. The pressure mentioned, viz.: 225 lbs. gage pressure, is much too low to effect the economies attainable.

Steam pressures have not kept step with progress in other directions. If they had, they would now be approaching 500 lbs. absolute, instead of 280 lbs. absolute.

In 1899 six cruisers were built for the United States navy. These were fitted with Babcock & Wilcox boilers whose pressures were 290 lbs. absolute. That is now 13 years ago. Why has a halt been called on increased pressures? Is it because of difficulty in getting suitable piston packing or suitable metallic packing for the rods? Or is it because boilers in their present form cannot withstand these higher pressures? If so, these objections are trivial, for they can be obviated. Rise in temperature has been regarded by many as an argument against higher steam pressures. But when it is realized that there is only a difference of 56 degrees in temperature between 280 lbs. and 500 lbs. absolute, this objection is seen to be invalid.

Large compound reciprocating engines of the horizontal type, in stationary plants, are using 150 lbs. pressure and 150 degrees superheat with perfect success, equal to a temperature of 511 degrees. The horizontal type of engine, it is needless to say, operates under more severe conditions than any possible design of vertical engine, marine or otherwise. A distinct gain in economy has been made as ratios of expansion have increased, but to proceed further in this direction in marine practice, steam pres-

sures must be increased, as the point of cut off cannot be advanced.

Quadruple-expansion engines or quintable-expansion engines will be relatively as superior in economy to triple-expansion engines as triple-expansion engines were found to be in advance of compound engines. Quadruple-expansion engines of proper design have already demonstrated their great superiority in the matter of economy to triple-expansion engines as is well known. Knowledge in the art of manufacturing high grade materials has advanced steadily, and it has now reached a point where very much higher steam pressures may be carried with safety. There is absolutely no doubt that engines and boilers can be built to withstand any pressure desired up to 500 lbs. absolute. This pressure when compared with Diesel engine practice is low, and Diesel engines undoubtedly are being operated successfully now, insofar as strains on parts are concerned.

Engines and boilers must be entirely redesigned to conform to such pressures and in doing so it will incidentally be found that some of the forms already adopted in boilers have been very far from perfection. With a pressure of 465 lbs. absolute at the engine, a superheat of 40 degrees might be carried on the seven vessels of the navy fitted for 85 degrees superheat referred to.

I claim for relatively higher steam pressures these benefits:

First. Greater economy in steam and therefore in fuel consumption per horse power. With 465 lbs. steam at the engine close to 15 per cent in steam consumption would be realized over present practice.

Second. Decreased size of steam cylinders, steam pipes, feed pipes and boiler plant.

Third. Reduction of weights in engine and boiler rooms.

Fourth. Decrease in space requred for machinery and fuel.

Fifth. Decrease in fuel required for a given radius of action. As the total heat units required to be absorbed by the boilers are less, for quadruple or quintable expansion engines than for triple-expansion engines, the machinery spaces and weights could be reduced accordingly.

McFarland is Aroused

Walter M. McFarland:—I called the attention of one of the speakers to the fact that he has made a broad general assertion which flatly contradicted a statement in the paper, and I thereby gave him an opportunity to correct what I think was an obvious slip on his part. He did not make that correction, so I must make the correction myself. As matter of fact, the paper by Capt. Dyson states distinctly that the gearing on the Neptune has been a decided success. In the proceedings of another society there was a paper descriptive of the whole ship, which paper went into great detail about the gearing, by the chief engineer, Lieut. Smith, in which he said the same thing, that the gearing has been a decided success. I do not want to detract at all from the credit which is due to Sir Charles Parsons for what he has done. I know the Vespasian was actually operating at sea before the Neptune was. I do know that the gearing on the Neptune was developed by Admiral Melville and Mr. Westinghouse, the two great men I had the honor of serving. I do not think that this gearing was put on the Vestasian before Admiral Melville and Mr. Westinghouse started their work and began to complete their experimental work. The experimental tests were made on the biggest scale of anything I have heard of—instead of trying it out on a few hundred horsepower, the test was made using 7,000 H. P., being a full size gearing, the gearing for a full-size ship. As I remember the figures for the Vespasian they were 700. Admiral Melville and Mr. Westinghouse tried 7,000 H. P., and gave it a working trial lasting 40 hours, the gearing being tested most carefully with an accurately standardized dynamometer, in order to determine the economy of gearing, and its efficiency, which was shown to be very high. That would count, of course, very strongly, as we have learned today, because we have heard how well the machinery of the Jupiter has performed in the shops of the General Electric Co., at the Schenectady test, and this gearing performed in the shop test of the Neptune before the machinery is put on board the boat, in the same way that Mr. Curtis has shown you, while the machinery of the Nevada has also performed equally well in the estimates and design. That is to say, in the actual dock test.

> **The Neptune's Gearing.**
>
> *I called the attention of one of the speakers to the fact that he has made a broad general assertion which flatly contradicted a statement in the paper, and I thereby gave him an opportunity to correct what I think was an obvious slip on his part. He did not make that correction, so I must make the correction myself. As a matter of fact, the paper by Captain Dyson states distinctly that the gearing on the Neptune has been a decided success. I do not want to detract at all from the credit which is due to Sir Charles Parsons for what he has done.*

The Neptune has been in service two years, and has had some quite heavy weather. The chief engineer of the ship says the gearing has worked successfully, so that I am surprised to hear a gentleman say that the only successful application of this gearing has been made by Sir Charles Parsons. I felt that I could not refrain from putting this on the record, out of respect for those two great men, Mr. Westinghouse and Admiral Melville, whom it was my pleasure to serve for many years.

Ernest H. B. Anderson:—I think Mr. McFarland is quite right. The gearing of the Neptune has worked exceptionally well, just the same as this paper says, at the same time, has the whole of the machinery installation worked well?

Walter M. McFarland:—I understand it works satisfactorily—not with economy—

Ernest H. B. Anderson:—That is the whole point—

Walter M. McFarland:—Let me finish—you asked me a question. Let me answer it, and do not stop me before I get through:—You want to know if it has worked satisfactorily. I understand it has, but not with the degree of economy that was expected by Mr. Westinghouse. They will put other turbines in that will give the full economy.

Richard H. Robinson:—One of the speakers who favored the turbine used the argument for it that a greater speed can be secured. As I understand the paper of Capt. Dyson, it is not indicated that the navy department makes any advocacy of reciprocating engines, as distinguished from turbines, except possibly in a ship such as a battleship, which is comparatively a slow-speed ship. This last summer I studied a good deal on the subject of high speed cruisers, and what they were for, as distinguished from battleships, and what they were for. As I understand the matter, a battleship operates in a squadron with other battleships, and if it should happen that two or three battleships in a squadron have a couple of knots of extra speed, they cannot use this to any advantage, as they cannot go off by themselves. In the case of the destroyers, however, they do go on and operate by themselves, and for that reason extra speed is an important element. I would like to ask Mr. Anderson about the subject of weights.

Subject of Weights

Ernest H. B. Anderson:—In regard to the question of weights, I would say that the different weights for these battleships, are as follows: Displacement—Delaware, 20,000; Utah, 21,825; Wyoming, 26,000.

The weights for the following items in the case of these battleships, are as follows:

Delaware main engines and lagging, throttle valves and fittings, forced lubrications on engines, pipes and tanks, exhaust pipes to condensers, 2

condensers each 11,788 sq. ft. C. S., all shafting, spring bearings and stern tube bushes, propellers and nuts, air and circulating pumps, 654.50 tons. In the case of the Utah and Wyoming, they are as follows: Turbines and lagging, turbine regulating valves and pipes, all valves and pipes between turbines, forced lubrication system, tanks and coolers, exhaust bends to condensers, 2 condensers, Utah 15,-225 sq. ft. C. S. each and Wyoming 14,000 sq. ft. C. S. each, all shafting and spring bearings and stern tube bushes, propellers and nuts, air and circulating pumps and vacuum augmenters for Utah, in the case of Utah 659.01 tons and in the case of Wyoming 648.23 tons.

In the paper the engine-room weight, net tons are given as follows: Delaware, 773.26, North Dakota, 785.-93, Utah, 919.80. That, of course, includes the fittings for the engines, the ice machines, in fact the whole thing.

R. H. Robinson:—I am unable to produce the exact figures, but I am in the fortunate or unfortunate position of having to float this stuff. I know that in every single case when we get a weight for reciprocating engines and a weight for turbine engines, there is a difference. Similarly, it is often the case that I have to make assorted insides for these ships, one to take reciprocating machinery and one to take turbine machinery, and I am very much convinced, from the information we have, that they do not go into the same space, as a matter of practical policy.

But, coming back to the subject of the increased horse power that may be up your sleeve with the turbine-driven ship, my own opinion is, if it is there, as it appears to be, the proper thing to do would be to squeeze down this machinery that you use on the ship, so as to give you the horse power that is necessary to give the speed you want, and make the ship smaller, or else put the difference to the credit of the consumption of fuel.

Ernest H. B. Anderson:—These are the engine room spaces for the five classes of ships, the Delaware, Utah, Wyoming, Texas and Oklahoma. Delaware, total area in sq. ft., 2,222; Utah, 3,060; Wyoming, 3,150; Texas, 3,210; Oklahoma, 3,480.

You will see from this list that the engine room spaces have steadily grown, and that the Delaware has not been repeated.

Limitations of the Turbine

Luther D. Lovekin:—There has been a good deal of talk about turbines and about reciprocating engines, and also some talk about reciprocating engines used for cruising purposes. A couple of years ago I made an investigation into the work of the late Dr. Thurston, wherein he prophesied that by this time we would be using steam, as Mr. Monteagle suggested, with 500 lbs. pressure. I tried to see what we could get out of it. I found limitations existed with the turbine. We know it is impossible to design a turbine and utilize the steam pressure that we can design the reciprocating engines for, so it seems to me, as I said at that time, that we have about reached the limit of pressures in the neighborhood of 300 lbs., with turbines, and it looks as though we must come to a standstill unless we adopt an entirely different proposition, and that is to use the reciprocating engine for 500 lbs. pressure and then exhaust the terminal pressure at 300 lbs. and utilize that through the turbine.

We all know that the reciprocating engine is a pressure engine, and is about the only engine you can use and get high efficiency with high pressure. The turbine is an ideal low pressure engine. I would not hesitate to suggest a reciprocating engine using 400 lbs. pressure and exhausting in turbines using 200 lbs. pressure, and we might show a water rate of about 9 lbs. While I do not know that there is anything novel about that suggestion, I am not advised it has ever been dwelt on before. We must come to that condition if we want to save coal.

Variety of Naval Work.

I notice in Mr. Curtis's remarks that we are not advancing, we are not trying out enough of these things, and I would like to state that within the last two or three years the navy department has had on its hands quite a basket of tricks. We have put in a large power installation of geared turbines, have put into a collier an electric drive, we have put into some of our destroyers a reciprocating engine-turbine combination, and we have considered almost everything else that was brought to our attention. I do not see how we can consider new things more than we have—what we have done almost covers the field.

W. H. Howell:—What pressures are used on the forced lubrication spoken of in the paper?

Hutchison I. Cone:—About 15 lbs. Mr. Curtis mentioned the comparison of the North Dakota and the Delaware as being rather unfair. He is right about that. It is. I mean to say by that that the North Dakota is of a design we know can be improved upon at the present time, and I know that Capt. Dyson did not mean to take exception to the Curtis design, based on that ground. The increase in efficiency of the Nevada, which Mr. Curtis called the new North Dakota, at full speed, on paper is very gratifying, but we did not receive any proposition to reduce the boiler power when the ship was being laid down. Of course, that practically is the answer to the question.

The new cruisers like the North Dakota, are designed better for full speed, appreciably better, but not quite so good at the low power. Mr. Curtis takes us to task quite severely for not adopting a geared turbine auxiliary rig for cruising conditions, and while I think it has great promise, putting it into a plant costing $12,000,000 to start out with, before it has been tried in service, is not good engineering. We will try it on something not quite so expensive.

Program of Navy Department

I notice in Mr. Curtis's remarks that we are not advancing, we are not trying out enough of these things, and I would like to state that within the last two or three years the navy department has had on its hands quite a basket of tricks. We have put in a large power installation of geared turbines, have put into a collier an electric drive, we have put into some of our destroyers a reciprocating engine-turbine combination, and we have considered almost everything else that was brought to our attention. I do not see how we can consider new things more than we have—what we have done almost covers the field.

To get down to Mr. Anderson's discussion, he makes a number of rather positive statements of facts, they are really questions of fact. He states that the turbine ship is not any more inefficient in a seaway, that the efficiency is not cut down by the seaway, while, on the other hand, we have a large number of reports from the fleet, made by the captains, navigators, executive officers and chief engineers of the ships, which point to the contrary. It is possible that they may have a little better data on this point than Mr. Anderson has.

Mr. Anderson states that the Idaho, Mississippi, and Connecticut are frequently at the yard for repairs. They are. We have had quite a number of accidents recently in our shafting, and I will take the trouble to explain to you gentlemen as American citizens, as well as naval architects, that the troubles we have are because of that. As distinctly stated in the paper, the ship with forced lubrication is free from trouble, it is true, Mr. Anderson to the contrary, notwithstanding, because I have better data on that than Mr. Anderson has. Mr. Anderson mentions ships that are mostly old—the Idaho and Mississippi are ships that were laid down as 17-knot ships, and put in the fleet and required to steam with 19-knot ships, which we found was not successful from the shafting standpoint. My opinion is that the firemen are now able to get out of the boilers more power than the designers allowed for, taking data available at the time they were laid down, and simply put in too much

power for the engines. These ships will overcome the shaft troubles.

As to the question of corrosion. Of course, it is hard for me to answer the broad statement that the corrosion is due to neglect. It is. Any corrosion is probably due to neglect but if you have a machine in the ship which you must turn over every 15 minutes to keep it from corroding it is a question of degree of neglect. If it is such a simple matter as Mr. Anderson would lead us to believe, I would like him to inform me how to overcome it. It is a serious thing, some ships corrode and others do not

Now, as to the weight of machinery. I would like to ask Mr. Anderson where he got that from, whence did the weights come? The weights that Capt. Dyson gave to you are positive, they are the absolute weights. We weighed the parts with a scale, and I think some of the representatives of the builders here will agree with me, that they obtained quite a price for that excess weight. If it had been the other way around, we would have heard from them, but as it is, we spent a good many thousand dollars in arriving at these weights.

Ernest H. B. Anderson:—The extra weights in the Utah over the other ships must include a large amount for magazine cooling such as additional ice machines, with all their consequent pipings and fittings.

Hutchison I. Cone:—The two additional lighting machines we have done away with.

Ernest H. B. Anderson:—It is the biggest surprise to us to read Capt. Dyson's paper and find that difference in the weight. We cannot explain it.

Hutchison I. Cone:—The difference in the size of piping made necessary by the different pipes, would not that make up this great difference?

Ernest H. B. Anderson:—The items already given in my paper under the heading of Delaware and Utah and Wyoming show what entered into the list. This list shows the amount of make-up feed water used in tons per day on the coal consumption trial of the scout cruisers at three different speeds. At 10 knots it was slightly in favor of the reciprocating engines, and at half power the reciprocating engine losses were about 50 per cent greater than with the turbine ships.

Gland Leaking

Hutchison I. Cone:—I cannot understand why the loss of water should be greater, to make up for the feed water, with the reciprocating engine, than with the turbine, for my observation with the turbine, and I have observed them a great deal on board ships, is that there is more leakage from turbine glands than from the reciprocating engine, considerable more. It is one of the problems that we would like the turbine people to solve, that gland leaking.

Mr. Anderson is correct in his statement, in his interpretation, that the navy department has not ruled in favor of reciprocating engines at all. We have taken in each case and put in what we think is the best instrument at hand at the time to meet the conditions. The question of cruising at 14 knots and approaching a speed more favorable to the turbine is one that we designers in the department cannot consider, as we are called on for definite cruising speed by the strategists of the department, and we are called on to give a certain cruising speed, and the cruising radius of our ships at the present time is ten knots.

In regard to the turbines, Mr. Anderson misunderstood the meaning of Capt. Dyson's paper, as I interpret it. I think there is no contention in this paper, as Mr. Robinson stated very clearly, for ships of high speed or large power, in favor of the reciprocating type of engine, and I am quite sure, from my dealings with Capt. Dyson, that he did not mean that at all, that the scouts are much more reliable at full speed, and that the reciprocating scout is considerably more economical at low speed, and as to the times that the ships have been in the navy yard, it is undoubtedly a fact that the turbine ships have been at the yard many more times than the scouts, but that is neither here nor there, and should not operate against the turbine, as we must remember that these are the first two turbine vessels to be built, and we have since improved on the design and management.

Lighting of Panama Canal

The Canal Will Be Lighted Throughout By Automatic Unattended Lights

THE Marine Lighting Equipment of the Panama Canal," by James Pattison, was the fourth paper presented, the character of the lighting being briefly summarized as follows:

"In accordance with the plans of the eminent army engineers who are carrying the work to completion, the Panama canal will be lighted throughout by automatic unattended lights, each having a distinctive characteristic. At the entrances and through Gatun lake a double row of about sixty automatic acetylene lighted buoys will mark the channel. The channel will be further defined by powerful, rapid-flashing range-lights, one set at either end of each successive tangent, thus permitting vessels going in either direction to take their range over the bow. The center lines of each range are set apart sufficiently to enable the largest vessels to pass one another in safety. Through the Culebra cut, or wherever the proximity of the banks permits, beacons will be used instead of buoys."

Jacob W. Miller: I have listened with a great deal of interest and pleasure to the able paper which has been presented by Mr. Pattison, and as I am more or less interested in the lighting of buoys and ship channels, I would like to ask him some questions, and get some light on two or three points.

He says on the first page of his paper: "It is generally conceded by lighthouse authorities that the lighted buoy is the greatest aid to navigation produced during recent years. It is inexpensive both in first cost and maintenance, and produces a highly efficient light of from six to fifteen miles visibility, which will burn without attention and with absolute reliability for long periods, even up to a year or more if desired."

I would like to take issue with him on that subject of the expense of lighting the buoy now in use by the Lighthouse Department—the lighting of the acetylene buoys used by that department at this time is very expensive, and the buoys cost from $2,000 to $4,000 each. The matter I have quoted, that one of the advantages of the buoys is that they could be seen from six to 15 miles, in my opinion that would be a disadvantage in the case of lighting a waterway like a canal. In my judgment the lighting of a canal should be in the nature of a series of stepping stones, so that the passage of the ship may be safe from one light to another, and if the rays of the light should go beyond each other, then, in that event, you get illumination which is blinding to the eyes of the captains in charge of the vessels, and interferes with the navigation of narrow channels. It seems to me that the

lighting of such a channel as the Panama canal could be very much better effected by electric lighting, with low-powered lights, as in the case of the Kiel canal, the Manchester canal and the Northeast canal.

I understand that in the narrower portions of the Panama canal such lighting as acetylene will not be used, but some such system as I have spoken of will be used. I hope there are some gentlemen here who are connected with the electric manufacturing corporations in this country, the General Electric Co., or the Westinghouse Electric & Mfg. Co., who can give us some information concerning the electric lighting of narrow channels.

James Pattison:—The same system of lighting is used on the Ambrose channel, the same kind of high candlepower buoys. As far as the buoys used in the Panama canal are concerned, the majority of them would be used through the Gatun lake, as I stated in my paper. The Gatun lake is quite a large body of water, and through the Culebra cut electric lights will be used. That is the plan of the army engineers. In a few of the locks and in narrow portions of the canal, electric lights will be used, just the same as in the case of the street lights. On the lake and at the end of the canal the system as is used all through the United States will be used, that is, high candlepower lighted buoys, placed half a mile apart, or a quarter of a mile apart, the same as on the Ambrose channel.

Life Saving Appliances

This Paper Was Largely Prompted by the Appalling Titanic Disaster

THE fifth paper read was W. D. Forbes' "Notes on Life-Saving Appliances", prompted largely by the Titanic disaster and dealing with lifeboats rather than with any other form of equipment. It was most extensively discussed.

Warren T. Berry:—Mr. Forbes refers to the building of lifeboats with steel. This is evidently a step in the right direction. The first officer of one of the large Atlantic ships told me recently of having completely destroyed two lifeboats in a boat drill by lowering them loaded to their full capacity, and suddenly checking the falls. There is evidently considerable room for improvement in the construction of the boat itself, and I think a steel keel is a step in the right direction.

Mr. Forbes refers to what he calls the hencoop system of life-saving, *i. e.*, a section of deckhouse so fitted that it can be released and floated off as the ship sinks. Of what value would this arrangement be in case of a fire serious enough to necessitate abandoning the ship? Should the round bar davit be damned by the faint praise that it has the advantage of simplicity only?

When fitted with the proper worm and gear attachment, it is adjustable as to outerage, as then it can be held either forward or aft of its extreme outboard position and so keep the lifeboat close alongside for loading or unloading if desired. I have seen at boat drills many times a 26-ft. lifeboat swung out, ready to lower, in less than two minutes with such an arrangement.

The figures given comparing the effort required to operate pin type and quadrant type davits are not at all conclusive, possibly because the pin type davit selected for comparison is not the best design possible. This also applies to the data given of time required to swing out boats with the pin type davits.

Not Conclusive

I have seen many times at boat drill a 26-ft. lifeboat put overboard with a rig of this sort in considerably less than two minutes. The figures given, comparing the effort required to operate the pin type and quadrant type davits are not at all conclusive. It possibly may be because the pin type davit selected for comparison is not the best design possible. This also applies to the data given of time required to swing out boats with the pin type davits.

I have recently witnessed a test of a pin type davit loaded with 2,500 lbs. deadweight, equalling a total load of 5,000 lbs. on the two davits, which is slightly more than the load on the quadrant type davits on the Kilpatrick test. No difficulty was experienced in swinging this load from the extreme inboard to the extreme outboard position in 50 seconds with two men. This davit was listed inboard 6 degrees, corresponding with the Kilpatrick list.

Harold F. Norton:—The paper just read has presented some very interesting information concerning life-saving appliances and has discussed various forms of boat davits, among others one or two unsatisfactory forms of what is termed in the paper the "fixed pin" type of mechanically operated davit. I should like to mention a satisfactory davit of this type, the sheath screw davit. It consists of a davit arm of structural steel channel or I-beam shape, pivoted at the bottom by means of a pin bearing in a steel casting secured to the davit arm by means of triangular brackets running well up the davit arm. The davit is rigged in and out by means of a screw working in a nut formed in the end of a steel pipe, the pipe being pin-jointed to the davit arm just above the ends of the supporting brackets, and the screw shaft being thrust journaled in a pivot bearing secured to the deck frame at the proper height to take a hand crank for turning the screw. When the davit is in stowage position, the screw is housed within the pipe sheath. The deck frame is made up of structural steel angles and channels, all so disposed as most advantageously to take the stresses which come upon them.

These davits have already been fitted on eight or ten ships and by several of the principal yards, the Newport News Ship Building & Dry Dock Co., Maryland Steel Co., the New York Ship Building Co., and the Quintard Iron Works, a number of sets are being manufactured by the latter company for boats of the Fall River Line. These sets are particularly interesting in that they are fitted with a winch for lowering and hoisting the boat.

By the courtesy of the Quintard Iron Works Co., a plan of the arrangement is attached, and it is certainly a neat and compact arrangement of mechanically operated boat davit and winch.

Fixed Pin Type

The fixed pin type davit shown in Plate 1 of the paper has a pin which is obviously too short and not properly supported in the fore and aft direction from the deck, nor is the support carried far enough up the davit arm, but the sheath screw davit provides against all these objections by the long and substantial pin, with brackets extending well up the davit arm, and properly arranged deck connections. It is, of course, perfectly easy to design a pin connection entirely capable of accepting all of the stress transmitted to it from the davit arm, or which the deck connections are capable of accepting.

Another point commented upon is the liability of the screw-operated davit to injury of the screw by the fore and aft swing of the boat. This point has never been taken very seriously for the reason that in the sheath screw davit the boat can never strike the screw but only the pipe sheath, and then only for a short part of the motion at the beginning when the boat is rising from the chocks, and when both sheath and screw are in positions to be least affected. Also the fore and aft swing of the boat is by no means so violent as might at first appear, which will occur to each member of the Society when he thinks of the necessarily slow longitudinal period of oscillation of a ship of any size, and then applies this to a pendulum of the length of the

davit falls with the boat suspended above the deck, and acting within the comparatively limited space between the end of the boat and the davit itself. The quadrant davit illustrated in the paper appears to have no particular advantage in this respect, since in its case the boat will strike against the cast steel quadrant or the davit arm itself, and be transmitted directly to the screw and guide shaft. The blow may also occur when the guide sleeve is in the middle between the ends of the screw and guide shaft, a position in which they are least capable of sustaining it without injury. However, both constructions are so substantial that there is really no serious danger of injury from any blow likely to be received in this way.

Quadrant and Fixed Pin Type

The next point discussed is the comparative effort on the crank for the quadrant and fixed pin types. It is a fairly simple proposition to figure static forces on an apparatus of this kind if the forces are in one plane, but when it comes to figuring frictional forces and making proper assumptions for coefficients of friction, the problem is much more difficult, and the expressions given in the paper appear quite too simple to be true. They are not probably true of the turning effort required on the crank of a sheath screw davit, for all the sets installed have been tested and found satisfactory, the empty boat or equivalent weight being readily rigged out with one man on each crank, in a little over one minute's time. It is quite true that the quadrant type davit is somewhat easier to start outboard than the fixed pin type, on account of the more nearly downward direction of the boat from the start, but this is accomplished at the sacrifice of the feature that the boat shall be naturally lifted from and over the chocks, and make some special form of tumbling chocks always necessary with the quadrant type. This type of davit ought theoretically almost to roll out of itself, if the ship is on an even keel, but the fact that some effort is required on the crank all of the way is due to the introduction of numerous forces and frictional resistances, many of which are not mentioned in the paper or included in the formula. The forces are not in one plane, but on the contrary, have several different planes and lines of action. By examining the construction of the quadrant davit illustrated in the paper, it will be noted that the davit arm is carried on an overhung pin cast in one piece with the sleeve embracing the guide shaft and the screw, the center line of the pin being about on the same level as the center line of the guide shafts and the center line of the screw being some inches below and about vertical under the guide shaft. The pressure of the davit arm on the pin therefore exerts a considerable moment on the guide sleeve in one direction, which in turn being transmitted to the screw produces a considerable moment in another direction. None of the forces are in line with each other, and even the pressure transmitted by the davit to the pin is not a simple pressure, as there is quite a twisting moment introduced by the fore and aft overhang of the davit. All these forces must produce considerable frictional resistance, not to mention the friction of the rough, rolling surface and the gear teeth where the quadrant meshes with the rack on the deck.

The forces on the screw-operated pin davit are somewhat simpler, being more nearly in line, but even in this case, figures are practically worthless, and seem useless in the face of an actual trial with the loaded boat or an equivalent weight. The paper estimates that the quadrant type is also slightly easier to rig in, but it is very doubtful whether this will be found to be the case in practice, and probably that on account of the various frictional resistances mentioned above, the quadrant type will be found considerably harder to rig in than a properly designed screw-operated fixed pin type.

It was not explained in the paper we have just heard, that the pin type davit mentioned on page 10 as being tested with very unsatisfactory results, is an entirely unusual arrangement, wherein both davits are operated together through the mediation of a steel shaft connecting the two, this shaft being revolved by means of a worm quadrant, worm and spur gears, ending in a hand crank operating the entire arrangement. This apparatus resembles a quadrant davit about as much as it does the usual pin type, as previously discussed in the paper, and it is very misleading to mention this as "the very interesting, practical and convincing test, which showed the disadvantage of the pin type davit," without explaining more in detail exactly what kind of a pin type davit it was.

But, of course, this feature probably did not occur to the author of the paper, as he doubtless intended no misrepresentation. The performance of the quadrant davit mentioned on the same page is about the same as should be expected of a well designed screw-operated davit of the fixed pin type, and is about what has been accomplished with the sheath screw davit.

Various Types of Davits.

It would appear from this paper that the writer's experience has been limited mostly to experiments with the Welin type davit, which is well designed and very efficient, and a few other types of davits of inferior design. I say inferior design, because there are davits of the various types mentioned that fulfill all of the requirements laid down in this paper. Among others might be mentioned the Norton davit. Mr. Warren T. Berry has made some interesting experiments with this type of davit and I am sure will be glad to give us the results of his experiments.

The principal advantage of the sheath screw davit, other than that it is simple and inexpensive and composed largely of structural shapes, so that it may be built at any shipyard or readily repaired in case of injury due to collision or other accident, is that in stowage position the screw is completely housed and protected by the sheath. The end of the sheath is closed by a watertight, removable cap and the sheath may be filled with grease for lubricating the screw.

In the quadrant type, illustrated in the paper the screw and guide shaft are exposed to the weather, protected only by a flat cover strap an inch or so above the guide shaft, and although they are both of brass, it would seem that the action of air and seawater must considerably increase the friction unless they are kept carefully cleaned and frequently greased. It also seems that a careless man might put a coat of paint on the guide shaft, the average painter being liable to consider it as proper a thing to paint as the cover strap just above it. The quadrant rolling in the groove with its gear teeth meshing with those in the deck rack, seem also to give such good opportunity for the accidental presence of foreign substances to make trouble, that it is remarkable trouble does not more often occur. Undue roughness or irregularity of either quadrant or deck casting will produce wedging action between the deck casting and guide shaft, or else throw all the weight of both boat and davit on the guide shaft. However, the large number of quadrant davits in successful operation shows that these conditions adjust themselves through the spring of the material, or in some such way, but it appears possible that they may make one davit of this type less easy to operate than another, and the same davit more or less easy to operate at different times, depending upon the kind of care it has had.

Sheath Screw Davit

The sheath screw davit is an attempt at still further simplicity, and foolproofness by further obviating the necessity for care, but there is still something to be desired, as the pivoted thrust bearing on the deck frame is now exposed to the weather. A further development in this davit which is now being attempted is the production of a satisfactory oil and watertight ball thrust bearing, so that this bearing may be kept full of oil and at all times protected and lubricated just as the screw is protected and lubricated by the sheath.

J. Howland Gardner:—I have listened with considerable interest to Mr. Forbes' notes on life-saving appliances. It would appear from this paper that the writer's experience has been limited mostly to experiments with the Welin type davit, which is well designed and very efficient, and a few other types of davits of inferior design. I say inferior design, because there are davits of the various types mentioned that fulfill all

of the requirements laid down in this paper. Among others might be mentioned the Norton davit. Mr. Warren T. Berry has made some interesting experiments with this type of davit and I am sure that he has a memorandum in his pocket and will be glad to give us the results of his experiments.

Round Bar Davit

There is another type of davit touched on in this paper—*viz.*, the round bar davit, that is turned by a worm and wheel. This device is passed over as being of some assistance, but has but one reach or overhang. This is not correct, as with this type of gear a lifeboat can be placed anywhere within the range of outreach of the davit from a point where the gunwale of the lifeboat is flush with the side of the ship in the extreme throw of the davit.

The particular boat handling device referred to is the Irvine handling gear. The rapidity with which a lifeboat can be handled with this gear was illustrated in a recent collision between our steamer Commonwealth and the Norwegian tramp steamer Volund. This collision happened about one o'clock in the morning, on Sept. 26, 1908. Immediately after the collision a boat crew from the Commonwealth was called, a lifeboat launched, and the entire crew of the Volund, consisting of 14 men, were rescued by the Commonwealth boat before the Volund sunk, and when it is considered that the Volund sunk six minutes after the accident, there can be no doubt of the efficiency of the lifeboat handling gear.

I happened to be on board the Commonwealth the night of this collision, and to my mind far more important than gear for handling lifeboats or even the lifeboat itself, is to have vessels so designed that it will be well nigh impossible for them to founder.

Next to the design of the ship is the necessity for a trained crew. With a trained crew, there are many types of boat handling gear that are efficient, and without a trained crew, the best and most elaborate boat handling gear will be inefficient.

There is another matter Mr. Forbes drew attention to, the time required to swing the old type davits out from the boat, and I want to say that the United States law requires a ship to be equipped with boat handling gear so that the boats can be launched inside of two minutes, and this must be done by some type of gearing used on the ship, and even includes the davit that is swung by hand.

A. P. Lundin: — I am surprised, first, to find that a discussion on lifeboats and davits has started in so lively. I thought there would be nothing short of a turbine that could create so much interest as has been shown in this discussion up to this point, and second, I am surprised that there seem to be so many members who are in the davit business.

Now, if we read Mr. Forbes' paper as a whole, it covers both lifeboats and davits, and I think that is the only way to cover it properly. This idea of building a lifeboat like an Indian builds his canoe, or used to build his canoe, which has been more or less the practice in the past, and this idea of having any sort of a davit that might be most convenient, or that might be the cheapest, is not the proper idea, I think, from an engineering point of view.

At the same time I do not agree always with the engineers in this respect. I think this question of carrying sufficient lifeboats and being able to efficiently launch them when you need the boats, is a matter that should be worked out in co-operation with the sailors, with the old salts. I was wishing, a little while ago, that I had some of you people, who are here today, with me at certain times in my past experience when we actually had to do some work with lifeboats. There are certain physical conditions that arise on board a ship. For instance, if you are hanging with your eyebrows onto a yard arm, and the arm is whipping around so that your point of suspension is describing an arc of 100 degrees, or say you are down in the fire room and the bilge pumps are out of order, and the bilge water washes over the place, creating the most hideous odor, that would overcome the strongest nerve; for instance, when you get alongside of a big ship, when a heavy sea is running, with a load of passengers which you have rescued from a wrecked ship, and when the sea is running so high that you think one minute your boat will land on the deck of the ship, and the next minute under the bilge; under those conditions I have found that engineering principles, and a knowledge of ship design, count for less than a strong stomach and a firm hand. That is one of the reasons I believe that this problem of lifeboats and davits should be worked out in co-operation between the engineers and sailors. If we take the problem as a whole, I do not think you will get a satisfactory system, unless you consider the boats and the davits in their relation to each other. When you design your ships, of course, you have to make arrangements to carry so many lifeboats, to give a sufficient capacity of lifeboats for the rescue of the passengers on the ship in case of need. Then comes the time to decide this as a whole.

Lessons From the Titanic.

I believe that the important lessons of the Titanic disaster are:

First, the necessity of eternal vigilance on the part of the navigator as the price of safety. Second, that naval architects and shipbuilders should make merchant ships, particularly passenger steamers, more secure against damage by collision, both in the way of additional strength of construction and additional watertight subdivision. Ships can be made much safer than they are at present, although the day of the practical, indestructible ship has not yet arrived. Lastly, provide sufficient lifeboat accommodation for everybody.

As regards Mr. Forbes' paper, where he speaks of the advisability of having the lowering controls in the boats, I cannot agree with him. I believe that, for one thing, it would encumber the boats too much and be difficult to keep in order. I believe that if Mr. Forbes had been in a lifeboat, like I have been once or twice, coming alongside of a ship in rough water, he would be more than glad to leave the hoisting end of it to those on deck, who stand on a firmer footing—that I am quite convinced of.

I agree with him that for ships of ordinary height that lowering controls are as good as anything else for lowering the boats, but if it comes to very large ships, where the boats are placed from 60 to 80 ft. above the waterline, it is a different matter, and I believe then, in that case, the system that Mr. Axel Welin, of London, has worked out for the Imperator of the Hamburg-American line will solve the problem. There are other times when you may not be able to hoist the boat, that is, if you stretch the problem far enough to provide for the rescuing ship. There are times when any common-sense sailor would consider it foolhardy to attempt to pick up the boat in the davits and hoist the whole load up. But then there are other ways out of it. You can, for instance, rig out one of your cargo cranes, if you have it, and provide it with a special basket like that which is used in the steamers in the Norwegian islands. They transfer most of their passengers, and embark and disembark them, in small boats, and the way they get on board in rough weather is by means of the use of these baskets. That is also used in ships running to Central America and South America, where in many places the ships have to anchor in the open roadsteads, and that is a system that could be used on ocean-going ships under extreme conditions.

Construction of Lifeboats

As regards the construction of the boats, it is very pleasing to me to know that government officials in this country as well as elsewhere are giving this subject some attention. As I said, it seemed, some time ago, like the average boat builder built the lifeboat like the Indian built his canoe. There should be some system of some kind about the construction of these boats, and that the question of building an efficient lifeboat is of sufficient importance to warrant that naval architects and marine engineers should give it some attention, and also the government, and the more stringent the rules and regulations governing the construction of lifeboats becomes, the better it will be for the ship operators, and in the end for the public at large.

There has been something said con-

cerning the efficiency of the pin davit. Mr. Forbes' paper looks to me somewhat mixed up—it is all pin davits, as far as I can understand it, although some are movable pin davits and some are stationary pin davits. It is a new term, which has come to the quadrant davit. I am not beating around the bush. You all know I am selling the quadrant davit. I will tell you why. I started in this business because I had some experience with lifeboat davits, and I found that the davits were not efficient, and before taking up any specific davit, I engaged some attorneys to furnish me with all of the U. S. patents on all kinds of davits, and also copies of all specifications on applications for patents, which were issued from time to time, and they kept on sending these to me until they ran up to over 2,000, and I had to ask them to stop. I glanced through some of the most interesting of these patents, and then I sifted it down to those that had actually been tried out, and I found that there were about 200 that had actually been tried out on board ships. I do not say that the davit has been tried out when you put it on a dock and experiment with it, or even on a ship and test it in the harbor. In my opinion, it has not been tried out until it has actually been used at sea, and some of these davits have been in use as long as three years. I still believe that the Welin davit is the best davit in the market today. I do not think it is the cheapest, but it is certainly the best.

Too Much Top Weight

Mason S. Chase: — I have been much interested in what Mr. Forbes has said about the desirability of having the best possible equipment of reliable lifeboats in sufficient number, also the necessity of having the davit or other launching apparatus for these boats strong, simple and under perfect control. The steel boats of the Lundin type would seem to fulfill the requirements of a strong, seaworthy lifeboat, and one which can be nested in groups of at least two, to economize deck space, and economy of deck space is an important matter. I would like to ask Mr. Forbes what is the weight of these lifeboats, per person accommodated? I have noted from some figures published in connection with the investigation of life-saving appliances by the Board of Trade in England that the weights given for open and decked lifeboats, also life-rafts, per person accommodated, ran from 68 lbs. to 72 lbs. and over. The weight of collapsible boats was given as about 40 lbs. per person accommodated. This item of weight of boats and weight of davits and other launching appliances is a very important one.

The stability of many existing ships would be seriously compromised by the addition of as much top weight as sufficient lifeboat accommodation for everybody would necessitate. Of course, this condition can be met by reducing the number of passengers carried to correspond to the lifeboat accommodation which can be provided.

The innovation introduced by a Japanese line of passenger steamers, running across the Pacific, of giving every passenger a ticket to a certain lifeboat seat may give some timid passengers a new feeling of security, but many will have their confidence in the safety of ocean travel much shaken by this innovation. Such a system of tickets for lifeboat seats will certainly give all passengers a new interest in lifeboats.

I believe that the important lessons of the Titanic disaster are:

Eternal Vigilance

First, the necessity of eternal vigilance on the part of the navigator as the price of safety. Second, that naval architects and shipbuilders should make merchant ships, particularly passenger steamers, more secure against damage by collision, both in the way of additional strength of construction and additional watertight subdivision. Ships can be made much safer than they are at present, although the day of the practical, indestructible ship has not yet arrived. Lastly, provide sufficient lifeboat accommodation for everybody, but remember that when an accident to a vessel occurs under severe weather conditions, such as are often met with in the North Atlantic, particularly in winter, that many of the lifeboats provided are likely to have been damaged even before they are launched, and that life in the boats would be so unbearably hard that most people would prefer to go down with the ship rather than to attempt to go into the boats, even if it is not absolutely hopeless to attempt to utilize the boats.

Spencer Miller: — The subject of this paper is, "Notes on Life-Saving Appliances", and yet we have practically heard of nothing but davits and boats. I have given this matter a little attention in the last two months, the matter almost having been forced upon me on account of my knowledge of the use of automatic reels for coaling at sea, and it occurred to me that this system might be available for use in life-saving. The whole question is one of paramount importance. Perhaps you do not realize that there were 562 ships lost in 1911, and a corresponding number in 1910. Five hundred and sixty-two ships a year represents a considerable loss of life on the ocean.

Now, there is another thing that should be thought about, and that is, that the whole matter of life-saving at sea is changed because of the introduction of the wireless telegraph. All passenger ships at sea carry the wireless telegraph, and every such ship is required to respond to calls for help received through the wireless telegraph. Under these circumstances the death toll of the sea is likely to be much reduced.

We must not confuse the ship's lifeboat with a surf lifeboat. The surf lifeboat is manned by a picked crew, men who are masters of seamanship. The work of rescue which they can do is one of the marvels of the day. The common ship's lifeboat has no such crews, it is a question whether it would even be launched, not to say anything about being the means of making a rescue from a wreck, and then bringing those who are rescued back to the assisting ship. The boat goes to the rescue with brave souls and willing hearts, but when they arrive, in nearly one-half the time, they will find themselves unable to render assistance, because they have not the implements. That is just exactly why I am talking. I am coming to that phase of the question under consideration. The report on the loss of the Titanic stated that if the sea had been running rough it would have been very doubtful whether any of the lifeboats would have reached the water at all, or, at any rate, reached it in safety.

Now, I propose to bridge this gap between the rescuing ship and the wreck with the common, well established breeches buoy apparatus, and the rescuing end of it will be fitted with an automatic reel to maintain a uniform tension on the connecting hawser to permit its length to run out. The line is always taut. You cannot snap a taut line. You can snap a line that slacks, but a line that never slackens can never be snapped.

W. D. Forbes:—The idea of this paper was to suggest something about life-saving appliances, and I laid down certain requirements. I do not think any of those who have discussed the paper have disproved my ideas as being incorrect. Capt. Lundin, I think, misunderstands my idea of boat control. It was not my intention that the apparatus should be in the boat itself, but on the deck of the ship, with a connection in the hands of the man in the boat.

No Suitable Variable Outreach

Mr. Berry has found that the hencoop system does not please him very much, and I think it would take a good deal of nerve to stay on the deck of a boat, even if it was ashore, with a platform that was knocked out from under you, and to go ashore on the hoops. The Welin davit is known to me, and it can be used, but that davit has no suitable variable outreach. It has a variable outreach, but it is in the arc of a circle, which makes it awkward to handle.

Mr. Norton's sheath davit is an excellent davit, but I fail to see why we need the sheath in protecting the screw. The force of the boat striking would not bend the sheath and screw as well, if it was made of the proper strength. The Commonwealth, at the time that the accident occurred to it, was in perfectly calm water, and the crew were able to get the boat down in quick time, but when you are in rough water, you want something besides a davit swinging out with a reel which cannot be easily controlled.

Mr. Miller speaks of taking out the slack of the rope which, of course, is an excellent thing to do, but that might apply to a row boat—I do not see how that hits my case. I can see that in towing a wreck it would be excellent.

Preservation of Metals

Dealing With the Metal of the Hull, Engine, Boilers and Machinery Accessories

THE sixth paper read was Lieut.-Comdr. Frank Lyon's paper on "The Preservation of Metals Used in Marine Construction." The author dealt with two sub-divisions; the metal of the hull, the metal of the engine, boilers and machinery accessories. The causes of the wasting away of such metals are three—corrosion, abrasion and erosion.

Henry Williams: — Commander Lyon has rendered valuable service in bringing before this society the question of the corrosion of metals, also in elucidating the electrolytic theory as to its causes and the conditions under which the electrolysis takes place. I believe, however, that few of those present will be willing to accept his statements in toto, for while there is no question that fundamentally he is correct, differences will be drawn as to the conclusions and the interpretation of the various phenomena.

He treats of a subject that unfortunately has not received much attention from shipbuilders, except in so far as the effects of corrosion have manifested themselves in necessitating repairs.

Largest Item of Expense

Painting, which is the largest item of expense in the up-keep of ships, is required almost entirely by the necessity for preventing or at least checking corrosion. Commander Lyon states the necessity for proper painting, but unfortunately he places himself in the attitude of regarding the price of a paint as an index of its efficacy. He states also his opinion that the best paint is none too good and should be obtained at any cost. I am unable to agree with his view in these particulars. In my opinion, paint should be selected entirely with a view to its fitness for the purpose for which it is to be used, having in mind always the value of service which it is expected will be rendered. Where it is intended to preserve the metal in inaccessible locations, it is obvious that within reasonable limits the cost should not be considered in the effort to obtain the most effective paint. On the other hand, if it is a question of painting for decorative effect the exterior surface of a ship in a location that is easily accessible and that has already a number of coats of paint on it, consideration should be given to the probable time the paint will be expected to last before repainting, and a cheap paint should be applied, if that will meet the requirements. However, I wish to emphaside my idea that the price is no index of quality of paint. I think often a cheap paint, properly compounded, has greater merit than the conventional high grade paints made with linseed oil, turpentine, lead and zinc.

Zinc Protectors

As regards the question of the use of zinc protectors, Commander Lyon appears to have lost sight of the fact that these zincs are put on for the purpose of protecting the steel from the electrolytic action produced by copper alloys used in sea chests and propellers. He states his experiments were by way of proving that the zinc had no effect in reducing the corrosion of steel alone. In order to demonstrate this point clearly, I have had prepared two small bars of steel with smaller bars of copper attached. On one of these couples the copper was surrounded by a frame of zinc. All were submerged in salt water, and the conditions may be regarded as exhibiting in an aggravated form the action that takes place continually between the steel of the ship and the copper in underwater fittings, as well as the protective effect of the zinc. These samples, which I will exhibit, have been submerged only about 72 hours and show in a striking contrast the corrosion of one, and its absence on the other. The zinc sample leaves practically no corrosion at all on the steel. The sample which has a copper lining is badly corroded.

The statements as to lack of advantage of using galvanized steel plating is hardly borne out by the experience in connection with older torpedo craft, some of which had their underwater bodies built of black plating. These have corroded much more rapidly than others where galvanized plating was used.

Another point to which I call attention in connection with the statements in the paper as to the corrosion of salt water piping, is the fact that this difficulty has been solved effectively on United States naval vessels by the use of lead-lined pipe for such purposes. This has eliminated the difficulties referred to.

The Marine Oil Engine

Lecturing before the Institution of Engineers and Ship Builders, at Grimsby, recently, Prof. J. Okill, of the Engineering Laboratories, Liverpool University, gave as the chief reason for the superiority of oil engines over steam for marine propulsion economy in fuel consumption and machinery space. Of the total heat energy in the coal fed into a steam boiler, supplying turbine engines, not more than 14 per cent is given out as useful work to rotate the propeller shaft, while a modern oil engine of the "Diesel" type has an efficiency of conversion from fuel to shaft as high as 32 per cent. Compared with a steam engine and its boiler, the oil engine takes up much less room.

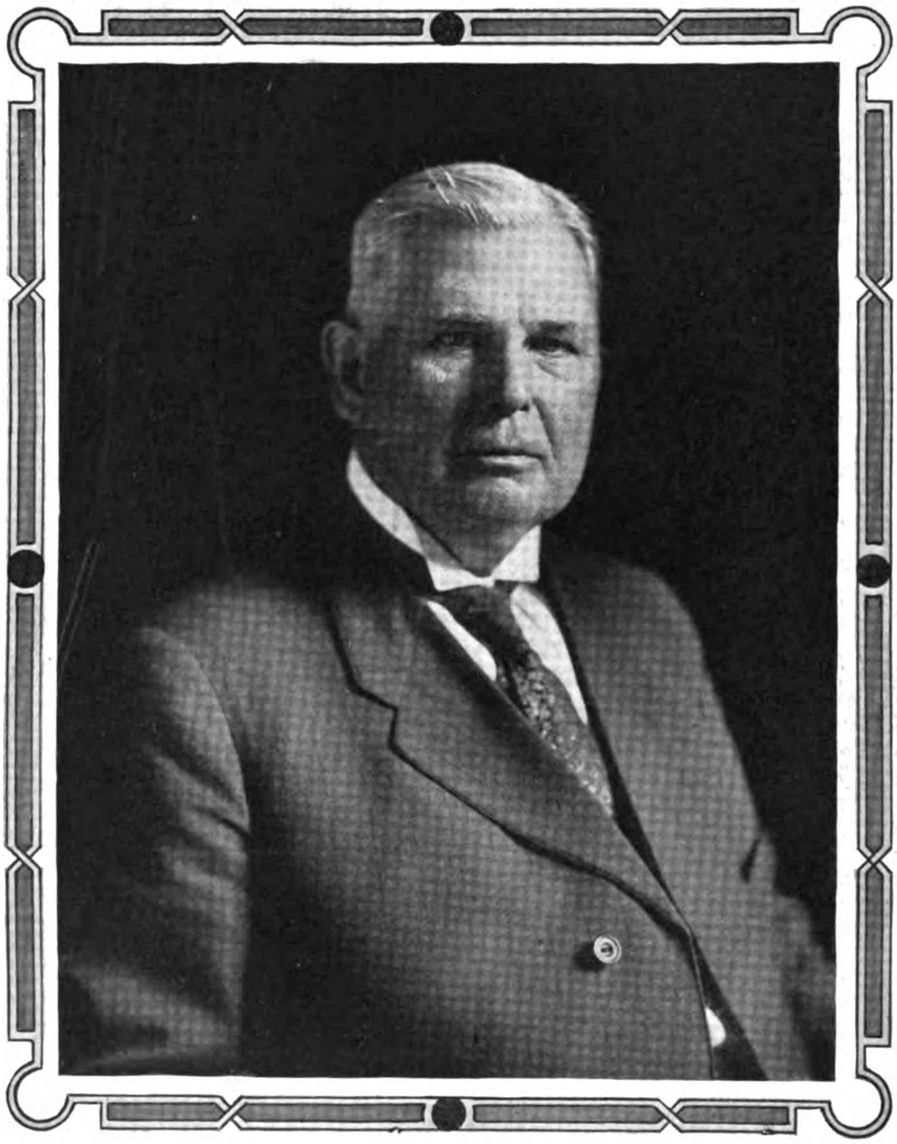
Bunker space is also considerably reduced, the volume of one ton of oil being about 39 cubic feet, while 44 cu. ft. is necessary to store one ton of coal. The greater heat value of oil, compared with coal, bulk for bulk, and its more economical use in the engine, are, however, the chief factors which contribute to the reduction in bunker space. The oil engine requires less auxiliary machinery than the steam engine, while by reason of the fact that the pressure units in an oil engine system comprise in most cases the engine cylinders and a few comparatively small air reservoirs, the advantages from this feature alone are of no small importance when considering the application to marine propulsion.

In recent years oil fuel as a substitute for coal for generating steam in a boiler has made rapid strides, and there is no doubt but that the success of this system of steam raising has to some extent held back progress in marine oil engine development. On the score of economy the oil-fired steam boiler will not bear comparison with an oil engine; oil-fired steam boilers are, however capable of reverting to coal fuel without delay should it become necessary. This may happen through failure of supply, or through an increase in the cost of oil fuel such as to render coal the cheaper to use. If the principal use of oil fuel were for steam raising and as a competitor to coal, then it is conceivable that oil fuel would always be obtainable, so far as supplies permitted, at a price in favor of its use. The success of the whole scheme of oil engine propulsion turns on an adequate supply of fuel.

Tribute to Stevenson Taylor

A Spontaneous Outburst of Regard and Affection for Its Retiring President

ONE of the fine things at the meeting of the Society of Naval Architects and Marine Engineers in New York last month was the spontaneous tribute of affection and regard which was paid to Stevenson Taylor, the retiring president. Mr. Taylor relinquished the chair during the session Friday afternoon to keep an appointment and was about to leave the room when Rear Admiral Washington L. Capps, vice president, detained him by saying that if he felt that he could escape any expression of the society's opinion he was very much mistaken. He then called upon Walter M. McFarland to say what he had in mind.



STEVENSON TAYLOR

"I believe I voice the unanimous sentiment of the society," said Mr. McFarland, "when I say that if it had not been for that clause in our constitution, which forbids a president succeeding himself, Stevenson Taylor would have remained in office indefinitely, or as long as he was willing to serve. We want him to know how greatly we feel our indebtedness to him for the able manner in which he has presided over our deliberations. He is a model presiding officer. He has conducted our affairs with decorum, with the best of taste and excellent diplomacy. His work in the interest of the society from the very start has been of the very highest character. He has been, in fact, one of the cornerstones of the society. But above all, above his ability as a presiding officer, as a marine engineer, comes his magnificent character and his splendid and lovable qualities as a man. Everyone of us who has had the privilege of his friendship for many years has grown to love him more and more as the years have gone by, and I can say for myself that I know of no higher type of American manhood than Stevenson Taylor, president of our society."

Mr. McFarland proposed a vote of thanks to President Taylor for the admirable manner in which he had conducted the affairs of the society during his term of office. The motion was seconded by Richard M. Watt, chief constructor of the United States navy, who said that it was his privelege to be a delegate of the society as well as a representative of the navy department at the International Jubilee Congress, held in London in the summer of 1911.

"Nothing," said he, "could possibly have raised the society to the highest level in the opinion of our British and continental colleagues more than the dignified, able and intelligent manner in which our president represented us."

Rear Admiral Harrison I. Cone, engineer-in-chief of the navy, spoke of the esteem and personal affection in which Mr. Taylor is held by the officials at Washington, and he believed his personal example to be one of the greatest assets of the society.

Jacob W. Miller said that as a steamship owner he had had the good fortune of being associated with Mr. Taylor for twenty-five years and during that time had entered into many contracts involving millions with him. During all that period the honor and integrity of Mr. Taylor and his company were never in question, that there never existed the slightest friction and that upon one occasion a contract involving an expenditure of $2,000,000 was given to Mr. Taylor and its conditions expressed on simply two pages. He considered the personal regard of Stevenson

Taylor as one of the greatest assets of his life.

"I almost regret," said Admiral Capps, "that I asked Mr. Taylor to remain because he has certainly had to listen to things that must make him feel as it has made us feel, a little choky in the voice. To have such a unanimous feeling from a body of men of this kind, which has had at times to be ruled with an iron hand, is truly a tribute of which any man should be proud."

It was with difficulty that Mr. Taylor replied and it was quite clear that he felt a little bit choky.

"I hardly know," said he, "which to do most, to grieve or to rejoice. When you elected me president three years ago, I looked upon that election as the climax of such a career as I might have had. It seemed to me then, and it seems more so to me now than then, to be the highest point of achievement that I could possibly reach. When one reaches the top of the hill one is apt to grieve, and that is why I say I hardly know now whether to grieve or to rejoice, but I am sure you will believe that after all I must rejoice much more than I grieve. That I have warranted any such remarks as have been made has been to me an unthought-of matter. I could not possibly have expected them and I thank you one and all. I thank you from the bottom of my heart."

Electrically-Driven Steamer

Mr. Donnelly's Proposed Fireproof Passenger Steamer Evoked Lively Discussion

THE paper which provoked the widest discussion was W. T. Donnelly's paper on "An Electrically Propelled Fire-Proof Passenger Steamer." The steamer described by Mr. Donnelly was intended to operate in the excursion trade in the sound.

Andrew Fletcher:—I think we all should thank Mr. Donnelly for his progressive thought and the time that he has put on this paper. But this is not, however, an entirely new subject. It has been under thought for some time, and the nearest approach to an electrically propelled vessel of any power is the Jupiter that is not yet running.

Based on Land Practice

It seems to me that Mr. Donnelly, in what he has just stated as to the coal per horsepower per hour, is basing his power entirely on the land practice. When that power is applied to revolve three screws I do not believe it will work out.

Mr. Donnelly has particularly spoken of the excursion class of steamers, and made a slap at the old beam engine, stating that there has not been any advance since 25 years after the Clermont was built, in other words, that the engine was fully developed about 25 years after the Clermont came out. Our concern, going over an experience of 60 years, has probably built more beam engines than any other concern in the United States, and possibly, I might say, almost more than all the other concerns together. So that I feel that in criticizing some of the statements that Mr. Donnelly has made, and desiring to do it in a conservative way, I feel that so much has been said about the old time beam engine by those who only have a superficial knowledge of its worth, that once in a while we have to get back at them.

Mr. Donnelly has made reference to the weight per horsepower. His figures are anywhere from 25 to 35 per cent out. He has spoken of the economy of the beam engine in comparison with his electrically propelled excursion steamer, and there I know he is fully 20 per cent out.

Weight Per Horsepower

He starts off in his paper by making a comparison with the old Grand Republic, one of the very oldest boats in the harbor. He states himself he does not know when the engine was built, but that it was many years before it was put in the Grand Republic in 1878. It is still going along, and I might say only yesterday the owners of the boat asked us to do some work on this old engine. But there he takes a type of an old beam engine, with a piston speed working, as he said, about 400 ft. per minute. He pays absolutely no attention to the modern excursion boat, fitted with a walking beam engine, where the speed is over 600 ft. per minute. We have vessels on the Hudson river with 72 in. diameter cylinders and 12 ft. stroke running from 28 to 29 or 30 revolutions per minute. So that to compare a beam engine, with a 72-in. cylinder, as he has expressed it here, with the Grand Republic, is absurd. He also does not state the advance which has been made in the paddle wheels. He takes the old boat, with the old style, less efficient waterwheel, and makes his comparison. This engine that he speaks of has a wheel 38 ft. in diameter. We would not think of putting in a wheel like that today, and have not for years. For that length and size of engine, if we wanted to run at double the speed we would put in wheels fully 10 or 11 ft. smaller in diameter, with less surface to the wheel, so that when you consider these statements the paper lost some of its effect with me because he has not thoroughly familiarized himself with the facts. I would not have you feel that I think the beam engines are the only engines for these boats, but it has always been our idea, shared by the excursion people, that this engine supplies the requirements.

As I say, I would not have you think that we are purely beam engine men because we produced the first Parsons marine turbine ship built in the United States, the Governor Cobb, and followed it with the Yale and Harvard. We have had cracks at all kinds of engines.

Flimsy Character of Excursion Boats

A reference was made in this paper, I think, as to the more or less flimsy character of the present excursion boats. We will find in the modern excursion boat that really in the past 10 or 15 years there have been many refinements introduced in their construction, for instance, the machinery and boilers are enclosed in steel all the way up. Steel girders are used in lieu of wooden girders and there are practically no wooden stanchions used. When it comes to the state room boats considerable advance has been made in them, and they have tried to fireproof them as much as practicable. We know that the substitute of the composite or the so-called "never split" panels is far safer than the pine panels formerly used. The Fall River line has given a great deal of thought to fire prevention. But the commercial side must be considered and in the vessel which Mr. Donnelly suggests the expense of construction would be so great that I do not know of any excursion company around the harbor of New York or anywhere else who would consider it.

There have been steel superstructures built. A boat was built which ran between Norfolk and Washington which has a superstructure entirely made of steel. I do not think

that boat has never been duplicated. The Pennsylvania Railroad Co. a few years ago also built a steel superstructure ferry boat, which runs from Camden to Philadelphia, which has given very good service, but in that latter case the superstructure is infinitely less than it would be on an excursion steamer.

Loss of Life

He makes reference here also in a general clause to the great loss of life. Of course, one life lost is a frightful thing. Going over a period from 1900 to 1910, the records in the supervisor inspector's office for the First district show that during the period indicated 3,730,616,085 passengers were carried, and the loss of life, from all causes, of every character, accidents, fire, collisions, everything else, was one life in 1,119,969 passengers carried. For the Second district, which comprises the harbors of New York, Boston, Philadelphia, New London, Albany, Portland, Providence, Bangor, Me., New Haven, Conn., for that period from 1900 to 1910, and this district takes in the frightful loss of life in the case of the General Slocum and also the loss of life due to the sinking of the Larchmont up in the sound, the government records show that over 2,960,432,640 passengers were carried and the loss of life was one in 1,905,807 passengers carried.

Mr. Bishop's own company states that in the 30 seasons that they have run their vessels they have carried over 60,000,000 passengers. This company operates the Grand Republic, referred to in Mr. Donnelly's paper. Mr. Bishop says: "In 30 seasons we have carried over 60,000,000 passengers between terminal points without the loss of one life, and this in view of the fact that in the season of 1911 alone the steamers made 2,974 trips between Coney Island and New York, 328 trips between Rockaway Beach and New York, 178 trips between New York and various groves with chartered parties and special excursionists, and about 250 trips to the fishing banks."

Warren T. Berry:—While I admire the Hudson river passenger boats and have the greatest respect for their designers, I do not think they represent the highest skill in naval architecture to which man has attained. Many of our lake and sound steamers, to say nothing of battleships, and vessels like the Lusitania and others, certainly represent indefinitely more skill on the part of the designer.

Regarding the necessity for fireproof steamers the authors state that it is "almost beyond comprehension why the problem has not received more careful consideration long before this."

If they will refer to the proceedings of this society for 1906, pages 1 to 29, on "The Construction of a Fireproof Excursion Steamer," by Mr. Gatewood, and "A Fireproof Ferryboat," by Mr. F. L. DuBosque, and the ensuing discussion, I think they will admit that the problem received considerable careful attention and consideration at that time, and I fail to find that the present paper overcomes many of the difficulties of fireproof construction advanced then, such as the discomfort to passengers and crew from heat in the summer in structures entirely of steel; the objectionable springiness of light steel decks; the additional weight and cost of steel upper works; and the troubles in connection with compass adjustment in such a structure.

The present paper contemplates a vessel of approximately the same length and beam as the steamer Grand Republic. The Grand Republic's boilers have 180 sq. ft. of grate surface and the design in discussion specifies nearly double this surface, or 352 sq. ft. Assuming vessels of the same size as to carrying capacity, will not the coal consumption be tremendously increased notwithstanding the reduction in consumption per horse power assumed in the paper?

Competition of Trolley

Cheap transportation by trolley has reduced most of the excursion business in this port to a very low standard of cost and I doubt that any material increase in the cost of operation or maintenance could be justified. If the vessel is uncomfortable or the price of transportation has to be increased to meet the requirements of larger coal bills and general maintenance, the steamer is not commercially practical.

The double hull construction shown in the midship section provides 16 in. clear space between outer and inner hulls at the side. How can this space be properly inspected, cleaned, and painted, or otherwise cared for?

It would be interesting to know the weights of the upper steel structure described in this paper. The increase in horse power from 1,400 on the Grand Republic to 3,000 seems to be considerable for a vessel of the same size and service.

The beam engines referred to in this paper at least seem to have the peculiar advantage of durability, and any one who has had experience in their operation can testify to their remarkably low cost for maintenance.

W. H. Fletcher:—We must not advise people to build, nor must we undertake to construct, something that will not pay after it is finished, due to its excessive cost.

You must consider that you can get about so much money to take a passenger from New York to Albany, and we must, in building a boat, cut our cloth to suit the job. The building of the boat and the type of engine which is used should not be considered altogether from a scientific standpoint. It is not fair, Mr. Donnelly, either to the traveling public or to the builders, or to the designers, to select the steamer Grand Republic as the typical steamer of the excursion passenger boat type of steamers in use today. For example, she is a wooden boat and her boilers are down in the hold. In the modern passenger boat of today the boilers are generally enclosed in steel cases. Electricity is another element that adds to the safety of these boats with the great wooden superstructure. The records show that we are far safer on one of these passenger steamers than in a fireproof building. We find that the fireproof building is not the safest place in the world in time of fire. There is no place wherein we run more risk from danger of fire than we do in a private house, particularly in the city of New York. I think if you will take the whole of New York city you will find that the loss of life due to fires in private residences—I mean the residences of people with means—is far greater in proportion than it is in traveling on these old wooden steamboats.

I think the General Slocum burned a little more rapidly than most other boats would, from the fact that when she first came out her joiner work, instead of being painted, was shellaced and varnished, and year after year that shellac and varnish was put on, and finally she was painted. The boat was a great, open structure, and the draft would blow through it like it would through the loft of a large building that had no partitions in it. There are thermostats in each stateroom on the night boats of both the sound and Hudson river boats. Of course, all these various installations which are designed for the safety and protection of the traveling public tend to increase the cost of construction, and we must not lose sight of the practical and commercial elements which are involved in the proposition.

I do not believe with your 3-screw propulsion on the Hudson river that you will get anything like the percentage of performance you will get out of the sidewheels, because the sidewheels seem to be the ideal thing for that particular place.

First Surface Condenser

George W. Dickie:—I am only going to say one or two words, because when I read this paper I got quite a shock. Apparently I had been boasting for a good many years about something that was not so. I thought when I was an apprentice that I had worked on the first, about the first surface condenser engine for steamboats that had been built. I am not near old enough to have done that.

if the statement in the paper is true, that the surface condenser was brought into service 25 years after the date of the Clermont. The Clermont was launched in 1807, and 25 years latter would bring us down to 1832, which was just 30 years before the time when I worked on about the first surface condenser that had been made.

Some 10 years ago I took a trip on a very fast passenger steamer, the Columbia, from Glasgow to Iona, the steamer making 24 miles an hour, side-wheel steamer, feathering wheels, engines making 44 r. p. m., oscillating 3-cylinder compound, two low pressure and one high pressure in the center. It was one of the most admirable pieces of engineering work I had ever seen. I made strict inquiries as to the consumption of fuel, and was told that it was 2.1 lb. for indicated horse power per hour, and I think it is very unfortunate that comparisons should be made in a paper like this, taking something that is exceedingly old and comparing that with the very latest, modern practice. I doubt, however, whether a three-shaft vessel operated second hand from the generator would equal that consumption I have just mentioned for the direct-acting oscillating engine. You know in Scotland the oscillating engine with the side-wheel steamer has the place there that the beam engine has here, and they have both been developed along that line to a remarkable degree of efficiency.

Charles M. Ingles:—I was one of the builders of the steamer Grand Republic, and therefore ought to know something about it. It says in the paper, referring to the engine used in the Grand Republic, "while its origin is now uncertain, it is believed to be between 50 and 60 years old." I would like to inform Mr. Donnelly that that engine came from the steamship Morro Castle, which was built about 1860, and today, if the company owning the engine wished to move it and put it in another boat, it could go on for 50 years longer.

Further than that, I would say in regard to expense, Mr. Donnelly does not tell us what the ship is going to cost. I am afraid that the cost would be such that the men in the excursion business in the port of New York would find it absolutely prohibitive. The excursion business is of short duration, and a very costly boat would not be profitable in that service.

Some Pointed Remarks

The history of the steamboats Grand Republic and Columbia is as follows: The boats cost, at the time they were built, less than $100,000, engines, boilers, and all the outfit complete. R. Cornell White managed and ran these boats for two years, when he failed. They were then sold and brought $70,000. The company which bought them and ran them for a time could not earn any money on them and they were sold, one to the Baltimore & Ohio railroad for $50,000, and the other, the Grand Republic, to the present company which operates it, for $60,000, and these same people also owned the General Slocum. The Grand Republic was then sold to the people who now own her for less than $30,000, and they are the only people who have made any money on her.

I do not see where you can add $90,000 to the cost of any vessel, and get that money back, or anything near get it back. Much emphasis is laid in the report regarding the loss of life by fire. I made the remark to a gentleman sitting near me that I have been in the business for many years, and know of only two cases of loss of life by fire on board a steamer, one was the General Slocum, and the other was the Seawanaka.

Engineering Always Changes

Anybody who has traveled around the world knows that every locality has its own kind of boats, and will use no other kind, and there is no boat anywhere in the world that is more characteristic of its locality than the side-wheel beam engine steamer as seen in New York harbor. But in engineering we must look at all sides of the case, and while marine architecture in certain localities is very conservative, engineering is essentially progressive and always changing.

The paper states that wooden vessels were not built after 1878. I disagree with that, because I built the steamer Adirondack in 1895, some years after 1878, and about the time that we built the Adirondack we built quite a number of other boats of wood. We gave up the use of wood finally, not because we objected so much to the wood, as to the fact that we could not get it and we had to go to steel. Mr. Donnelly says in the paper: "Attention is called to the detailed design for the steel deck in which very light plates are used running across the vessel, with their edges flanged and united to steel carlins. The upper surface of the plating is to be covered with canvas which makes a water-tight and weather-proof joint where the plates meet." He does not say how light or how far apart the carlins are to be. He says he will put some canvas on the deck, but I do not know how he will put it there. I did not know any one had found out how to do that. There was one steel vessel constructed in Birmingham, in which they had put down a steel deck, and they tried to put canvas on it. They sewed the canvas and then put it on the deck with glue, but the canvas only kept in position on the deck long enough for the boat to come from Europe to America. Then they put a one-quarter-in. wooden deck on top of the steel deck and fastened the canvas in the usual way. I believe that proved satisfactory.

As I say, Mr. Donnelly does not tell us anything as to the proposed cost of the vessel, and there is no information regarding the weights, and so we cannot answer any of these questions as to how much she will weigh and the probable cost. Hudson river steamers do not count for much, apparently, because the sound steamers have hotel accommodations aboard. The gentleman seems to have lost sight of the fact that there are anything but excursion steamers going up the Hudson river. We have some steamers on which we do carry a few passengers and feed them. We carry, as a matter of fact, about 2,000 tons of freight on shallow water.

The statement is made in the paper that between the time the boat lays up in the fall of the year and the following spring when she undertakes the excursion business again, she could be laid up at some little town and furnish that town with electric light and power, etc., but what will the inhabitants of that town do for the four or five months during the summer when the boat is in its regular excursion business and is not available for furnishing light to the town?

The last item in the paper goes to show that there would be a great saving in coal by the adoption of the type of vessel described, that at least $9,000 could be saved in coal. The amount of coal consumed by the Grand Republic this year for 80 days, which is her usual term of service, amounted to a total of 1,920 tons, that cost $5,760. That is the sum total of the entire cost of the coal, and how a man is going to save $9,000 out of that, I fail to discover.

A Word for the Railways

W. L. R. Emmet:—Anybody who has traveled around the world knows that every locality has its own kind of boats, and nobody has found a way of making the people of one place use the kind of boat which the people of another place have devised, and there is no boat anywhere in the world that is more characteristic of its locality than the side-wheel beam engine steamer as seen in New York harbor. But in engineering we must look at all sides of the case, and while marine architecture in certain localities is very conservative, engineering is essentially progressive and always changing.

Now, what has been said at gre-'

length about the safety of a wooden or iron vessel is obvious to everybody. We all know that many things spoken of as dangerous are really safe as compared with the risks of our ordinary lives, but we want to consider that people go a long way to make a small improvement. They do it as a matter of sentiment and principle. I suppose that the New Haven railroad carries about 1,000,000 passengers a day and I do not remember ever having heard of one of them being burned alive. A steel car is just as difficult a thing and just as an inconvenient thing to make as a steel superstructure on a boat. Furthermore, we cannot say if we try to study it, how simple or effective the steel superstructure might be made, and I think the effort to make it ought to be treated with due respect.

As to the general type of the boats and their method of propulsion, Mr. Donnelly's statements as to the inadequate design of existing boats of this class, while they may be subject to criticism in regard to detail, are in the main certainly true.

Comparing the methods of propulsion proposed in this case, we must consider that the high-speed turbine, such as Mr. Donnelly proposes to use in this case, is a device far simpler than the reciprocating engine of any type, and turbines which would propel this vessel are not materially larger than our president's desk, and are of such proportions that two or three men could lift the top off them. They only have two wheels with two rows of buckets on each wheel, and with any one row of these four rows of buckets the ship could be run at half speed. The shafts are very large in diameter and there is nothing to the mechanism but two bearings. Such a device is very simple to repair and it requires practically no expense to operate.

Simple Uses of Electricity

I will give you an example of the simplest possible uses of electricity: The Detroit Edison Co. is operating a large sub-station out in the suburbs of Detroit, without any attendant in it. As a matter of precaution they go through the form of sending a man there to watch it function, to make sure that its automatic functions were operating correctly. The processes of starting that sub-station, synchronizing it and getting it on to the circuit, and getting it to work, are all operated from distant stations and is done directly and simply. The reason is they are using simple rotation and there is no mechanical functioning which has to be performed. Electrical functions do not need personal contact for their performances. They can be performed from a distance, and the mere closing of switches is a very, very simple matter. The ordinary electric functions performed in a hotel in connection with the annunciating systems are a thousand times more complicated than anything which it would ever be necessary to do on board ship, and the chances from trouble from one of these little devices in connection with every room in the hotel is far greater than is essentially associated with the electric machinery necessary to drive a ship.

The economy in the application of this method of propulsion to this vessel is a question, in my opinion, much more of the propelling device than of the prime mover, although I have no reason to suppose that the propelling device proposed would not be good. I could imagine that in zero weather there might be some difficulties about getting a high efficiency of propulsion, and that conditions of such a character might outweigh advantages in fuel economy incident to the better prime mover, but as to the economy of the prime mover itself, there can be no question. It will take far less steam than the reciprocating engine which would be used for such a type of vessel.

Simple Use of Electricity

I will give you an example of the simplest use of electricity: The Detroit Edison Co. is operating a large sub-station in the suburbs of Detroit, without any attendent. As a matter of precaution they go through the form of sending a man there to watch it function, to make sure that its automatic functions were operating correctly. The processes of starting that sub-station, synchronizing it and getting it on to the circuit, are all operated from distant stations.

One reason for using the sidewheels on such vessels I have always understood is the absence of vibration, the vibration of propellers being apt to shake the superstructure. I think in this boat Mr. Donnelly does not have to deal with this question so much, because it is not a boat upon which people sleep, but with three propellers of high speed I should think that would not be serious, but I personally have no knowledge as to how effective this propeller might be, and suggest it as a subject for interesting discussion.

The electric design proposed in this paper, which Mr. Donnelly has himself decided upon, is the result of experience with dredges, I understand. The method of control of the speed of the motors is one that is commonly used in various forms of application of induction motors to such things as hoists, and it is done by cutting resistance into the secondary of the motor and so slowing it down without interfering with the continuity of voltage on the driving circuit. All the methods of electric propulsion which I have proposed have involved a slowing down of the turbine, or a variation of the voltage, and a control of the speed of the vessels by the turbine. In this case it is proposed to increase the resistance in the rotor of the motor, and by slowing it slow the motor down, and bring it nearly to rest, and then reverse it and bring it up the other way, and by this means the control will be similar to the direct current control used on the Chicago fireboats, and to do this you will simply work a contact lever in the pilot house and by so doing reduce the speed of the motor and reverse it, and raise it again, so that the only action in controlling the boat will be moving that lever. That method does not give the best economy at low speed. There is certain loss due to the resistance at low speed. At high speeds it would be as economical as other methods.

The Design is Practical

Mr. Donnelly brought this design to me exactly as he stated. I approve of its practicability, it is entirely practical and perfectly so today, and the turbines would work reliably and so what he said they would do, and the electrical control would be perfectly satisfactory, and any motor speeded up or slowed down or reversed at will from the pilot house.

One other point, as to the question of auxiliaries, it is proposed to operate the principal auxiliaries by steam turbines. I think in this vessel, since you maintain a continued voltage and frequency on the prime mover that these auxiliaries should be run by motors. The use of steam turbines for such purpose is extremely wasteful of steam, whereas the motor gives you power from the prime mover at the very least loss.

S. D. McComb:—I believe that the ships here around New York harbor could be made better from a fireproof standpoint than they are. The shipbuilders around New York harbor are not doing as good work in that line as the ships on the great lakes are doing. The City of Detroit III, which was built in Detroit last year, and the new See-and-Bee, now building in Detroit, are safer, from a fire standpoint, than the boats which are made here. It is true we have steel hull boats and have steel decks, and have put entire steel engines and boiler casings all the way up, but the carlins are of wood, and there are a lot of decorations and things which are very inflammable in various parts of the boat. On the great lakes they are sprinkling their boats. The Commonwealth and Plymouth are sprinkled, but the new Hudson river night boat, now being built in Hoboken, I

understand, is not to be sprinkled. In my opinion the shipbuilders around this port could add sprinkling equipments for materially reducing the fire hazards and not increasing the cost of the boats very much. In a freight steamer, the principal danger comes from fire originating in the cargo and coal bunkers. The coal bunker fires have nearly all been due to the old coal remaining in the bottom of the bunkers and fresh coal being placed on top of it. If some system could be devised so that the coal in the bunker is completely used up, spontaneous combustion would be rare. Two or three years ago we had a fire chief at one of our meetings, and he spoke of putting a system of perforated pipes through the cargo, so that water could be pumped into the hold of the ship in case of fire. There are steam extinguishers used now, but I do not know of a case where water is used. There is an experiment going on now, in which naval architects may be interested, of installing perforated pipes to use pyrine in the hold of cargo steamers. Pyrine has done some wonderful things. The pyrine extinguishers are now installed in all of the subway trains, as it is about the only extinguisher that is a non-conductor of electricity. The pipe can be very small, and yet it would be very efficient.

Sprinkler Systems

There have been two arguments used against installing sprinkler systems and fire-fighting devices in the holds of big steamers, and one of them has been that the fire insurance underwriters or marine underwriters will not allow sufficient rebate in the premium to pay for the cost of this installation. The other is that that system complies with the law. I do not believe any good naval architect considers the steamboat inspection law as representing the highest type of construction possible. I think it would pay the shipowners as well as the naval architects to investigate the question of sprinkler systems.

Stevenson Taylor: — The difficulty with the paper which Mr. Donnelly has presented is simply this: He has made a number of statements that seem to me to be unwise, to put it as mildly as I can, and I wrote him a letter calling attention to some of these statements, and in his reply to me he felt he must stand by his opinions. If he had kept his paper strictly to the subject, without indulging in the comparison, this discussion would have been avoided, and you would have lost the experiences you have gained by the discussion, and therefore I think, after all is said and done, Mr. Donnelly is to be again thanked for that reason. I will particularly say that there is no one new thing in the paper of Mr. Donnelly.

He first refers to the steel structure of hulls, to the double bottom and double sides. The construction of a boat on the plan suggested by him, in my opinion, could not be taken care of and would have to be modified very much. The steel structure surrounding the boiler and engines is not new. The centrifugal pump that he claims is absolutely new, is now being built by a company in which I have an interest to be installed in certain vessels. The scheme of an electrically-driven boat has been discussed in the papers presented to this society by Mr. Emmet. The fireproofing construction has been discussed as far back as 1906, and, notwithstanding Mr. Donnelly's statement that it is incomprehensible that it has not received more careful consideration, I will say that it has received very careful consideration in the last 25 years to my personal knowledge, and nothing but the impracticability of constructing boats of this type for other purposes than excursion boats has kept them from having been constructed.

So, as I say, broadly speaking, there is nothing new in this paper; notwithstanding that, gentlemen, and notwithstanding the fact that excursion boats and other boats have carried for many years billions of passengers with extraordinary safety, with far greater safety than attends the people of the city of New York in traversing their streets, yet we must recognize that it is quite within the range of possibility that an excursion steamer may burn up and we should do everything we can to make the lives of passengers still safer on boats.

W. T. Donnelly:—I do not find that Mr. Fletcher made any statement that would contradict the accuracy and applicability of the principles laid down in the paper. He questions the economy of the engines. I am very well aware that very much better economy can be gotten with the feathering paddle and with a large number of revolutions, but we do not have them in the excursion fleet. I am directing this paper particularly to that class of boats, and I think that is specifically stated in the paper.

Regarding the loss of life which has been taken up, it is not a question of the number in a million—because I am one in a million—and I do not care to sacrifice my life on that account.

Cost of Operation

We as engineers are dealing with progress and development. We are dealing primarily with property to be created. Whether I will or will not be able to produce a steamboat which is really fireproof is something which remains to be seen, but if it can be produced that will be the standard construction—the fireproof construction—and it will be produced, if it can be, whether it remains for me or some one following to do it.

The second speaker, Mr. Berry, spoke of the cost of operation. The cost of operation of these boats, if we are to consider them as a power-producing plant and means of transportation, should be less. As to the matter of the greater amount of power, certainly there is a greater amount of power. If an engineer has learned anything, broadly speaking, he has learned if he has to tackle any problem which is new, that he must have plenty of power.

Tendency to Greater Investment

As to the increase in cost, there certainly would be an increase in cost, but we would never have had the modern office building if some one had not had the initiative and courage to increase the cost of construction of these buildings. There is nothing in our modern life but shows increased investment, two or three times over in many lines, and the result is economy of operation, but I think the whole tendency of modern development is towards greater investment and smaller return on the money.

As to the remarks of Mr. Wm. H. Fletcher, he stated that the cost would be too great. It is simply a matter of the cost as against the earning power. My experience with regard to the number of people traveling on these excursion boats is that at the present time the excursion bsiness is confined to a very limited class of people who use these boats. There is a vast population in this neighborhood that I believe would take advantage of the summer excursion pleasure trips if the same attractive features that they find in other things were put before them in these excursion boats. That is a matter, however, entirely within the judgment of business men, and unless the judgment of business men agrees to that proposition we will not have the steamers.

Wm. H. Fletcher claims I made an unfair comparison with the Grand Republic on account of the conditions of this old steamboat. I think it is the best that could be made. It stands at the head of the summer excursion fleet in this vicinity. I did not compare it with a New York and Albany boat, or a boat of the Fall River line, because I am not in that class, and I am not attacking that class of boats at all. I can see, though, as these gentlemen say, that there will be a reflection on that class of steamers if a strictly fireproof steamer is built. That they must stand. I do not see any reason for stopping the progress of the art because the reflection will not be entirely satisfactory.

The danger is said to be very small. That is brought out repeatedly. It is not a question of the danger, or how

small it is, but it is a question—Can we make it smaller? We have made more progress in every other line, and it seems that we should, as engineers, do all we can to make progress in this line.

I was pleased to have Mr. Englis speak as he did of the construction of these boats and their cost. I think that a cost of $100,000 30 years ago would probably compare with a cost of $250,000 or more, today, as to the relative investment which would be required in these boats. In the matter of entertaining the people, my experience is that we must furnish the best that can be had, and then something better. We have built hotel after hotel in New York city, and the designers of these hotels have searched Europe for extravagant adornment for dining rooms, drawing rooms, and other rooms in the hotel, and it is not found that we have reached the limit yet. It seems to me if you are going to entertain people on the water in a steamer that some similar way of looking at the problem might have some commercial value.

Superstructure of the Boat

Mr. Ingalls has had more experience than any one else in the matter of the superstructure of these boats, and it was by an oversight that the plan showing the superstructure of the boat in question, the carlins, etc., was omitted from the paper. In my opinion, there is no question that a fireproof deck and carlin can be made. I think that will be done, but, certainly before commencing the construction of the steamboat, a full-sized sample would be constructed and tested. We will not stop short of doing that.

In the matter of saving coal, these figures given in the paper are based on the performance of the vessel at full power. The figures bear this out. I am delighted to know that the Grand Republic can be run for a season of 80 days on an output of $5,760 for coal.

Mr. Emmet has referred to the matter of machinery and the power in this vessel. I think there is no better authority as to what may be expected from electrical apparatus than Mr. Emmet. His standing in these matters is well known. As to the auxiliaries, as to whether they should be steam or electric, that is a matter of detail, which could be changed any time before the construction of such a vessel. My selection of some steam auxiliaries was with the idea of having steam for the feedwater, as is practiced in some of the land stations, of preserving enough auxiliaries under steam to furnish steam to heat the feedwater.

Charles M. Engles:—In relation to the engine of the Grand Republic, Mr. Taylor calls my attention to something which slipped my mind. The engine was originally built for the steamer Cosmopolitan, which was constructed by my father, and launched on Lake Erie in 1853. The engine was taken out of the Cosmopolitan about 1862 and put into the steamer Morro Castle, and from the Morro Castle it was put into the Grand Republic.

Andrew Fletcher:—Mr. Donnelly stated that I had not argued the question as to the modern excursion boats. When we bring the matter right down to modern excursion boats built for this New York service, the latest one is the Thomas Patten, a steel hull boat, boilers enclosed with steel casings, with an engine making between 500 and 600 ft. of piston speed, against the Grand Republic with 400 ft. of piston speed.

Conclusion of the Sessions

E. H. Peabody then read his paper entitled "Developments in Oil Burning", which was briefly discussed by Walter M. McFarland. He said that all the statements made in the paper were the product of experience, being the result of investigating mistakes which had been made in previous practice.

R. E. Gillmor then presented his paper, "The Sperry Gyro-Compass in Service", upon which there was no discussion. The paper entitled "Rudder Trials U. S. Sterrett", by Assistant Naval Constructors R. T. Hanson and J. C. Hunsaker, was then read, which was briefly discussed by Prof. William Hovgaard, saying:

"The data given in this paper I consider of great interest, for experiments on this subject are, on the whole, badly needed. The modern increase in speed and length of ships has necessitated the use of very powerful steering gear, and experiments on such bigh-speed vessels as destroyers are, therefore, of very particular value. It is to be regretted that complete turning trials, including the determination of the various elements of the turning circles, were not undertaken at the same time as the rudder experiments were made. That would have added greatly to the value of the experiments.

"Referring to page 9, the conclusion that the angle should be reduced by the full amount of the drift angle, is certainly erroneous. According to an analysis which I have made of numerous turning trials, the deduction should be much smaller than the drift angle. I agree, however, with the authors of the paper that the deduction should probably be some function of the drift angle.

"The conclusions stated on pages 11 and 12 are certainly very interesting and the numerical data are *decidedly novel*. Conclusion No. 6 points strongly in favor of placing the steering engine right aft or at least in the engine room. I never could see the advantage of placing the steering engine forward, as it requires very little looking after. I have only one point to criticize, and that is a minor one. In Appendix III, and on Fig. 8, the word *stress* is used in some cases to mean the total compressive force on a spring. The word "stress" in exact language means a force divided by an area, I would suggest that the word *load* used in other cases by the authors be used throughout so as to avoid confusion."

The concluding papers were "Logorithmic Speed Power Diagram", by Thomas M. Gunn, and "Tool Steel for the United States Navy", by Lewis Hobart Kenney, but owing to the lateness of the hour, there was no discussion upon them.

Elmer A. Sperry's paper, entitled "Active Type of Stabilizing Gyro", and E. H. Rigg's paper on "Notes on Fuel Economy as Influenced by Ship Design", will be discussed in the January MARINE REVIEW.

The sessions ended, as already stated, with the annual dinner at the Waldorf.

German Ship Building

An unusual increase in German tonnage is at present going on, and most of the large companies have an almost unprecedented number of vessels in the building. Thus the Hamburg-Amerika line, on Oct. 1, had no less than 19 ocean steamers, of an aggregate tonnage of 270,000 gross register tons in course of construction, including three fast boats, each of 50,000 tons, for the Hamburg-New York trade; further, a passenger and cargo steamer for the Panama trade of 19,000 tons, and a similar vessel, of 18,000 tons, for the La Plata trade.

The North German Lloyd has during the present year ordered 11 steamers, of an aggregate of 108,000 gross register tons, amonst them a passenger and cargo steamer of 35,000 tons, whilst at the beginning of the present year there were already on order four steamers, of an aggregate of 47,000 tons.

The Hansa Steamship Co., Bremen, had at the beginning of the year six steamers ordered, their aggregate tonnage being 54,000 tons. The Hamburg-South American Steamship Co., at the beginning of the year, had four steamers, representing 26,000 tons, on order, and up till Oct. 1 four more steamers have been ordered, their aggregate tonnage being 56,000 tons. The German-Australian Steamship Co. has 11 steamers under construction, of an aggregate of 110,000 tons; the figures for the Argo Steamship Co., Bremen, were three steamers at the beginning of 1912, and four since ordered. Most of the companies have found it necessary or expedient to increase their capital in consequence of the many new steamers ordered.

THE MARINE REVIEW

DEVOTED TO MARINE ENGINEERING, SHIP BUILDING AND ALLIED INDUSTRIES

Published Monthly by

The Penton Publishing Company

Penton Building, Cleveland.

CHICAGO	1328 Monadock Blk.
CINCINNATI	503 Mercantile Library Bldg.
NEW YORK	1115 West Street Bldg.
PITTSBURGH	2148-49 Oliver Bldg.
WASHINGTON, D. C.	Hibbs Bldg.
BIRMINGHAM, ENG.	Prince Chambers

Subscription, $2 delivered free anywhere in the world. Single copies, 20 cents. Back numbers over three months, 50 cents.

Change of advertising copy must reach this office on or before the first of each month.

The Cleveland News Co. will supply the trade with THE MARINE REVIEW through the regular channels of the American News Co.

European Agents, The International News Company, Breams Building, Chancery Lane, London, E. C., England.

Entered at the Post Office at Cleveland, Ohio, as Second Class Matter.

December, 1912

Great Oversea Trade

The year which is drawing to a close has enjoyed unparalleled prosperity in oversea trade. Never since the world began has there been such an interchange of commodities between countries. The growth of this interchange was first noted in September, 1910, and to the surprise of everyone, it has continued since in an ever-growing ratio. Certainly ship owners have never enjoyed such a long continued season of prosperity before. Cargo space is very scarce and freight has had to wait on the docks for weeks for lack of vessel tonnage. Ship owners have tried to meet the demand by liberal orders to shipbuilders, but ships are not built in a day, and apparently they cannot be created fast enough to meet the demand.

The shipyards of Great Britain have on the stocks or under order 505 merchant vessels of 1,846,830 tons gross, and many of the shipbuilders have had to refuse orders on account of their inability to make early delivery. Ship owners are obviously anxious to take advantage of the excellent freight rates prevailing which are in fact three times what they were two years ago and are complaining that their new tonnage has not been put into the water as rapidly as it should. However, the shipbuilders are doing all that they can and are fabricating the ships as fast as the mills can furnish the steel. The steel mills have been delayed by strikes and the shipyards in turn by a lack of sufficient number of skilled workmen.

It is clear that the productive capacity of British shipyards is not sufficiently elastic to encompass such a situation as exists at present, due undoubtedly to the control which the unions exercise over the apprentice system. It is, of course, impossible that the present pressure of cargo capacity can long continue, but it must be admitted that there is no present evidence of its coming to an early close. On the contrary, it seems probable that there will be a heavy demand for ocean transport facilities for some time to come. It seems unlikely, therefore, that there will be any material drop in freight rates in the near future and as long as ship owners can see a profit in ship-owning, even at the present increased capital cost, which is over 50 per cent greater than it was three years ago, they will continue to place new orders with the builders.

Admitting Ships' Material Free

That shipbuilding material rider in the Panama canal act has certainly provoked a great deal of discussion since the act was passed. If little thought was expended upon it before it was inserted, a great deal has been expended since. It has taken the treasury department at least three months to make up its mind what it means and meanwhile it has disturbed business everywhere. The shipbuilders were inclined to look favorably upon it until they discovered that under the interpretation which the treasury department intended to place upon the measure whole ships could be imported free with engines, boilers and auxiliary machinery complete. This put quite another light upon the matter and the president himself became somewhat alarmed.

At the recent meeting of the Society of Naval Architects and Marine Engineers at New York the subject was freely discussed and it was deemed advisable that the administration should have some technical advice on the subject. The interpretation as originally formulated would wipe out the shipbuilding industry in the United States. As it is, the interpretation which has been put upon it and issued to the customs office is broad enough. Shipbuilders feared that structural materials finished and ready to be assembled in the ship could be imported under the clause, but the treasury department has ruled that such material may be imported free provided it has been purchased in the open market and not constructed or fabricated upon a special order or after a special design. This, of course, while admitting ship plates, prevents the importation of a ship in a knocked-down condition.

Machinery, including all the propelling mechanism, and also auxiliary machinery permanently incorporated in the hull of the vessel, such as pumps, steering gear, lighting plants, refrigerating plants, steam winches, hoisting engines, generators, motors, condensers, feed water heaters, exaporators, switchboard, etc., will not be admitted free of duty, nor will consumable goods such as provisions, wine, coal and medicines.

Under the term "outfit and equipment" appropriate for the navigation, operation or maintenance of a ves-

sel and not permanently incorporated in its hull or machinery, are included such things as anchors, chains, cables, tackle, boats, repair parts, life-saving apparatus, wireless telegraph apparatus, nautical instruments, searchlights, signal lights, lamps, furniture, carpets, table linen, tableware, bedding, arms and ammunitions. All these may be imported free, not only for original equipment, but for renewal or replacement. Nuts, screws, bolts, steel plates, ships' knees, flooring and other things which, though complete articles in themselves, are useful as parts in the construction of the whole ship, may be imported free. Raw materials, such as pig iron and lumber, to be worked up into the finished state for hull or machinery, and rough forgings and castings, but not finished ones, may be imported free.

Neither materials for the construction or the repair of vessels or of their machinery nor articles for outfit and equipment will be admitted free of duty when imported to be kept in stock for sale, but they may remain in the warehouse for three years and upon withdrawal within that time will be entitled to free entry.

Application for the free entry of materials to be used in the condition in which imported shall be made to the collector of customs at the port of importation, but they may be used in another customs district upon transfer of entry papers. It would seem as though this legislation was making a lot of work for the customs department in tracing the eventual use to which the articles are put.

The point that impresses one most is that it is utterly unnecessary legislation. It had no part at all in the Panama canal act and appears to have been put in as a counter to the legislation incorporated also in the same act permitting foreign-built ships less than five years old to be purchased by American citizens and to be operated under the American flag in the foreign trade. This provision admitting foreign-built tonnage is more important than appears at first glance. In fact, since the present century began, it is estimated that more than $30,000,000 have been spent for ships flying the American flag engaged in foreign trade.

Lake Season of 1912

The 1912 lake season is over. In many respects it was the best that the lakes have ever enjoyed. More freight was moved than has ever been moved before and practically every vessel found employment, showing that the trade has fairly well assimilated the surplus of ships that existed even as late as two years ago. It must be borne in mind, however, that the elements themselves contributed somewhat to this absorption and there were long periods in which the fleet was delayed by fog.

The season of 1913 promises to be even better. If nothing unforeseen occurs, it will be better, and leading shippers are already getting into a state of preparedness for it. The movement of freight during 1912 was practically confined to the period from May 1 to Nov. 30, very little being moved during April. It looks now, however, as though should weather conditions favor, the fleet will start as early as possible next spring, and one may therefore expect a fairly heavy April movement.

Next season will open upon a rising market and it is therefore likely that vessel owners will obtain a better freight rate in the dominant trade of the lakes than they did during 1912. Ore prices have advanced in sympathy with the increased selling price of iron ore and the whole iron industry has been placed upon a basis where it may confidently expect to make a little money. It is well known that there has not been much money made in the iron business during the past three years, neither in mining the ore, nor in transporting it on the lakes, nor in smelting it into pig iron. The iron mining companies and the merchant furnaces are now assured of a reasonable profit and undoubtedly it will also extend to the transportation end. Freight carrying charges will be at least 5 cents higher than they were during 1912, and may be even 10 cents higher.

The lake trade has been handled very smoothly and no trouble has been experienced with labor anywhere. The wages have been the highest ever paid and creature comforts all that any man may reasonably expect.

There is, however, pending before the senate a bill known as the Wilson Seamen's bill, which if passed in its present form, will create a great deal of trouble. Its provisions are not at all adaptable to lake conditions, though it applies to the lakes as well as to the ocean. Navigation on the great lakes is unlike deep sea navigation owing to mere physical characteristics. Lake vessels are rarely ever out of sight of land and are touching port every day or two. There exists no necessity on the lakes for paying the men off every time the vessel touches port. They are paid either by the month or at the end of each round trip, and it is certainly imperative that they should be required to make a round trip, otherwise the vessel might be left short-handed at an upper lake dock. Nor is there any necessity for three watches, which would add 40 per cent to the crew numerically without increasing its efficiency a particle. Representatives of the Lake Carriers' Association have visited Washington in the endeavor to have some of the provisions of this bill modified, and it is to be hoped that they will be successful. Legislation of this character should be drawn by men familiar with actual conditions.

The bill, if passed in its present form, would increase the crews of lake freighters by 33 per cent by putting them on eight-hour shifts. That proposition is really absurd, as none of the crew is ever overworked. Moreover it would be impossible to accommodate them on the average freighter without building additional deck houses.

Obituary

Clement A. Griscom, for many years one of the leading figures in American maritime affairs, died at Haverford, Pa., on Nov. 10, at the age of 72 years. He began his commercial career with the shipping firm of Peter Wright & Sons, being admitted to partnership six years later. In 1871 he became one of the founders of the International Navigation Co. through his direct negotiations with the late King Leopold, of Belgium, and was elected vice president, becoming president in 1888. After absorbing the Red Star Line the company acquired the Inman Line, renaming it the American Line. He built the St. Paul and St. Louis, at Philadelphia, and purchased the New York and Paris abroad, congress at his instigation passing an act allowing American register to foreign-built ships, provided ships of equivalent tonnage were built in the United States. Mr. Griscom was associated with J. Pierpont Morgan in the formation of the International Mercantile Marine Co., which took over Mr. Griscom's companies as well as the White Star Line, the Atlantic Transport Line, the Leyland Line and the Dominion Line. Mr. Griscom served as president of the International Mercantile Marine Co. until 1904, when he resigned to become chairman of the board of directors. Mr. Griscom was one of the founders and the first president of the American Society of Naval Architects and Marine Engineers. He was a director of the United States Steel Corporation and Pennsylvania railroad and was connected with more than a score of financial institutions.

Gustav H. Schwab, head of the firm of Oelrichs & Co., general agents for the North German Lloyd Steamship Co., died at Litchfield, Conn., Nov. 12. He withdrew from the active management of the line in November, 1910, following a general breakdown due to overwork. He was born on May 20, 1851, in New York City, and was educated in this country and Germany. He entered the firm of Oelrichs & Co. on July 1, 1876, and was extremely active in both private and public affairs until his retirement two years ago.

Sir Christopher Furness, of the firm of Furness, Withy & Co. and of the Furness Line of steamers, died on Nov. 10 at London. He was born at West Hartlepool April 23, 1852, and had persued an enormously active life. It is said of him that had he lived in the United States with its great latent resources, he would have belonged in the Morgan or Rockefeller group. He served in Parliament from 1891 to 1895 and again from 1900 to 1910. He was knighted in 1895 and was created first baron of Grantley in 1910. One of the latest efforts of his life was to endeavor to place his vast works upon a profit-sharing basis, but was compelled to abandon it after a consistent effort, owing to the indifference of those who would have been the chief beneficiaries.

Capt. Orville W. Green, one of the veteran vessel masters of the lakes, died at Los Angeles on Nov. 28. He retired about eight years ago. His last command was the steamer Arthur Orr, then owned by the Elphicke Steamship Co., of Chicago. Death was due to infirmity attendant on old age.

Capt. George F. Cleveland died at his home, 14074 Euclid avenue, East Cleveland, O., of old age. He was one of the charter members of the Ship Masters' Association, and had a long and honorable career on the lakes.

Capt. Philip Carl Meyer died in a hospital at Sandusky on Nov. 15. He began sailing on the old American Eagle running from Sandusky to the Islands, but during the past 10 years had been in the employ of the Gilchrist Transportation Co., Cleveland.

Close of Lake Season

Iron ore shipments during November were 4,072,674 gross tons as against 2,523,253 gross tons during November, 1911, an increase of 1,594,421 gross tons. The movement for November, however, is not a record as it is exceeded by the November movements of 1907 and 1909. During November 1907 the fleet moved 4,156,076 tons and during November, 1909, 4,899,220 tons. The November movement during 1912 therefore shows a considerable falling off from that of 1909. The reason is that leading shippers, notably the Pittsburgh Steamship Co. and the Cleveland-Cliffs Iron Co., practically closed their ore shipping season on Nov. 23, sending forward, in fact, very little ore after Nov. 15. During December only three small cargoes were shipped, totaling 14,579 tons, making the total movement by lake for the year 47,435,777 tons, an increase of 15,305,366 tons over the movement of 1911.

The close of the lake season has been very gratifying from the vessel owner's standpoint. While practically all of the ore was moved at a reduction of 5 cents over last season's carrying charges, netting only 40 cents to the ship from the head of the lakes, the grain and coal cargoes during the fall months were carried at quite a stiff advance over the usual rate, and a number of vessels were enabled to recoup their financial losses. In fact, some of them probably made sufficient on the last trip to pay interest on bonds. It is now expected that 1913 will be even better than 1912. Furnace men entered the market very early to cover their ore requirements for next year. In fact, they were liveral buyers before ore shipments ceased during the present year and it looks now as though the leading shippers would open navigation as early as possible in the spring. Few of them for that reason are taking coal for winter storage. Iron ore prices for 1913 delivery are from 55 to 65 cents a ton higher than 1912 prices, and are therefore only 10 cents lower than the 1911 prices. The guarantee of iron content remains the same, 51.50 for non-Bessemer and 55 for Bessemer.

In sympathy with an increase in the price of iron ore, which is justified by the sharp advance in the price of pig iron, will undoubtedly come an increase in the freight rate. It is already admitted that the increase will be at least 5 cents, but vessel owners feel that they are entitled to 10 cents. The great increase in the movement of 1912 over 1911 shows with what ease the lake fleet can handle a trade that fluctuates within such wide limits. The movement of ore was really confined to the period from May 1 to Nov. 30, as only 204,042 tons of ore were shipped during April last. From June to October inclusive shipments were over 7,000,000 tons per month, a record never before equaled. Unless something unforeseen occurs, the 1913 movement will be still heavier as the April movement will probably be quite heavy.

Following were the shipments by ports:

Port.	Nov., 1911.	Nov., 1912.
Escanaba	513,790	560,328
Marquette	244 135	214,431
Ashland	168,909	414 224
Superior	800,531	1,140,767
Duluth	476,563	1,080,066
Two Harbors	514,325	662,858
	2,523,253	4,072,674
1912 increase		1,549,421

Port.	Dec., 1911.	Dec., 1912.
Escanaba	......	10,428
Two Harbors	......	4,151
	......	14,579

Port.	Season 1911.	Season 1912.
Escanaba	4,278,445	5,234,655
Marquette	2,200,380	3,296,761
Ashland	2,429,290	4,797 101
Superior	9,920,490	14 240,714
Duluth	6,934,269	10,495,577
Two Harbors	6,367,537	9,370,969
	32,130,411	47 435,777
1912 increase		15,305,366

Wilson Seamen's Bill

The senate sub-committee on commerce is now giving consideration to the so-called Wilson Seamen's bill, which passed the house at the last session. This bill is fathered by the Seamen's union and is most unreasonable in many of its provisions. The bill purports to prevent unskilled manning of American vessels, to encourage the training of boys for the merchant marine and to protect life at sea by requiring full crews with proper shifts. The American merchant marine in so far as deep sea navigation is concerned, operates at present under considerable disadvantage in competition with the ships of other nations owing to the regulations governing wages, food and area of living quarters. The Wilson bill makes the conditions even more onerous. For instance, a vessel sailing under the American flag would be required to carry a crew of 32 as against a crew of 24 on a similar vessel sailing under the British flag. The measure is made to include both deep sea sailing and lake navigation, though the two are as opposite as the poles. It is impossible to make a measure common to the lakes and the ocean, owing to mere physical differences. There is no occasion for increasing the crew one-third on lake freighters, and moreover, they could not be accommodated without building extra deck houses.

Representatives of the Lake Carriers' Association have attended the hearings in Washington to point out these differences and have met with many provoking experiences. The representatives of the unions present have made a number of preposterous statements to the committee. For instance, Victor A. Olander, secretary of the Lake Seamen's union, testified that lake vessel owners compelled their crews to work 18 hours a day while the vessels were being loaded and unloaded. Vessels are dispatched very quickly at loading and unloading docks these days, and no member of the crew is expected to work beyond his watch.

Patrick Lynch, of the Firemen's union, possesses an even more vivid imagination. He testified that firemen were carried from the fire-room on lake vessels in a fainting condition, owing to overwork and unbearable heat. It would be well if the inland members of the committee on commerce could be taken on a trip on a lake freighter. They would doubtless be much amused over the hardships complained of. The stokeholds of modern freighters are very roomy affairs and the ventilation is perfect. The whole lake fleet has practically been reconstructed during the past 10 years, and living conditions aboard them are far more comfortable and sanitary than the average dwelling. As far as being too hot, firemen have been known to leave the stokeholds to go into the engine room to get warm.

The bill seeks to have crews paid off when the vessel reaches port. Obviously lake vessel owners are desirous that their crews shall sign for a round trip.

Withdrawing Sale of Fuel Oil

W. R. Haynie, American representative of Carels-Freres of Ghent, Belgium, manufacturer of the Carels-Diesel engine, says that by actual test a Diesel-engined ship can pay seven cents a gallon for oil as compared with $2.50 per ton for coal in a steamer and yet show a net saving to the shipowner, due to economy in cargo space and saving in labor. He does not seem to think that the decision of the Standard Oil Co. to cease the sale of fuel oil after Dec. 1 will especially affect the Diesel engine. Upon this subject he says:

"The average American concern, either manufacturing or transportation, has found available a large supply of either coal or oil for fuel to such an extent that the idea of saving this product does not seem to have occurred to them at all. Many of our best engineers have continued to recommend the installation of types of plants that would show great saving in fuel consumption, but the custom or habit of the American has almost become fixed 'that when the fuel comes easy they burn it wastefully,' just the same as is their attitude towards money, that 'where they make money easy they spend it wastefully.' This is not found to be the case in European countries, where they save every possible product whether it be fuel or otherwise. The European manufacturers are charged up by the United States manufacturers as being difficult competitors, due to their low cost of production, and this low cost is not all due to the low priced labor, but largely to economical methods applied in their manufacturing plants, one of them being a saving of fuel costs in developing their power and heat, as, for instance, they briquette all of their soft coal, thus preventing even the winds from wasting any of the coal dust.

"In the United States, where we have the greatest source of supply of oil in the world, and where consumption is rapidly increasing, the question arises as to why not conservate the use of oil by the application or economical methods.

"The new type oil engine is recognized in Europe as a standard prime mover both for land and sea service. It requires the use of from one-quarter to one-third of the volume of oil that a steam engine demands in order to deliver the equivalent energy. The largest shipping concerns, such as the Hamburg-American, Hansa Lines, the East Asiatic, the Furness, Withy, the United Steamship Co., and all of the admiralties are adopting the use of this type of engine, due to its economy in fuel consumption. Why not adopt a method of using oil in the manufacturing plants that will require only from one-quarter to one-third of the volume that is required at the present time by burning this oil under boilers to evaporate water into steam to be used in steam engines, etc. This would tend to lessen the cost of the fuel as also to cheapen the costs of the several manufactured products and give the manufacturers a better control of the available supply of oil in the United States."

Diesel Engine Not Affected

Editor MARINE REVIEW:—Replying to yours of Nov. 27, it is not our understanding that the Standard Oil Co. is withdrawing fuel oil from sale altogether, but that they will refuse to make long-time contracts for deliveries at a fixed price.

We are assured that the Diesel engine will not, in this connection, be affected. The fuel oil affected by their order, as we understand it, is a grade of oil for which they have been getting very much less, under contract, than has been paid right along by operators of Diesel engines. The Diesel uses any grade of fuel oil. We can use crude, if they will let us have it, or we can use the residues from oil refining, which is not known to the trade as a fuel oil at all.

Moreover, we have some plants that are running on tar oils, or gas oils, whichever you please to call it, residual from the coking of coal. The kind of oil a Diesel uses for fuel is not required to be of a certain grade, as is necessary for other kinds of oil, or so-called "oil" engines. The fuel for the Diesel requires no pre-heating, gasifying or vaporization, but is discharged into the cylinder of the engine in its raw state, the only thing done to it being to atomize it or divide it into a fine spray. Upon be-

ing discharged into the cylinder of the engine, the oil takes fire from the heat caused by previous high compression of air therein and burns gradually, resulting in smooth and even pressures, more like those of a steam engine than the explosive pressures of other kinds of internal combustion engines.

So you see we are not worried by the recent move of Standard Oil and have noticed little appreciable advance in the price of oil fuels for Diesel engines, and you may be sure we would have heard from it, had there been much advance, for we have now over 150 plants wherein we have installed Diesel engines in various lines of industry throughout our United States, an aggregate of more than 60,000 H. P.

As a matter of fact, the more gasoline, kerosene and lighter oils there is demand for, the more residues there will be as fuel for Diesel engines. Any way the proposition works, as we see it, we will be better off.

Busch-Sulzer Bros. Diesel Engine Co.
St. Louis, Mo., Nov. 29.

Seats in Lifeboats

Editor Marine Review:—In the current number of the Marine Review I note that in one of the editorials you remark that the Toyo Kisen Kaisha are giving coupons for seats in lifeboats with each ticket. I do not think that there is any especial novelty in that, inasmuch as when I crossed somewhat over 10 years ago from San Francisco to Yokohama I found a notice in my room to the effect that in case of trouble I was expected to stand by boat No. (whatever it may have been). Twice on the voyage boat or fire drills were held and were excellently carried out in the way of speed and discipline. We passengers entered into the spirit of the drill and took our stations near our respective boats.

I freely grant that your contention about the "high side" would make it a bit hard in time of actual disaster; still why could that not be obviated by some such scheme as Capt. Randall, of the American Line, advocated some years ago? If I remember it rightly it was to provide a species of railway athwartships to carry boats from one side to the other so that either set of davits could be used.

In the case of the Titanic, everything was favorable for getting boats off. Had any sort of breeze been on I greatly doubt if many of the boats would have survived even had they been properly launched.

It is as you say, that it is now a question of bulkheads being properly carried up and properly built to withstand any head of water they may be called upon to stand, rather than a question of boats.

I crossed on a steamer once—she has since been lost—and remarked the fact that the supposedly watertight door between her engine room and fire room was not watertight at all for the light of the fires could be easily seen through the side. From the engine room forward for two firerooms, if I remember rightly, there was no watertight division. This ship stayed afloat for about 12 hours after the accident, but finally the bulkhead gave way under strain.

I have crossed the Atlantic many times in ships of various lines, but never yet have I seen a boat or fire drill and in some cases the boats were, or looked to be, stuck to their chocks by paint.

Given proper bulkhead construction and proper drills for boats—with enough boats for more than all—there is no reason why any serious disaster might happen. Personally, if I knew a ship to have decent bulkheads I would rather stick to her than take to the boats, and that is what I believe a great many people on the Titanic did, thinking that it was impossible for her to sink.

By the way, I saw a boat drill on an English ship as I was coming up the Red Sea once and I may add that it was so slowly done that the old tub would have plenty of time to sink before the boats were provisioned. In theory the work was excellent; but the practice was rotten.

I would not take the T. K. K. too much to task about their idea. In the first place they do not carry a superabundance of passengers, either first or second. I am not positive but I do not think that any of their boats of the Tenyo class ever carry more than 200 of both classes at the outside and certainly not very many more coolies.

Had it not been for the innate chivalry of men a great many more could have been saved from the Titanic.

Personally I think the T. K. K. scheme is good—provided they still have their drills—for when a passenger knows what boat he belongs to and takes an interest in his drill when the time of emergency arises, there is liable to be far less panic.

Very truly yours,
Chas. G. Fitzgerald.
Esperanza Garrison P. O., Md.,
Nov. 30.

Description of New Buffalo Steamer

Editor Marine Review:—I wish to congratulate you upon your November number. The details of the new Cleveland & Buffalo passenger steamer are most complete and their liberality most unusual, particularly with regard to the machinery installation.

The designer of these engines is also deserving of high praise; they exhibit not only a grasp of the importance of the unit but an eye to symmetry and an attention to detail that is extremely satisfying.

The perspective view at the head of the article exhibits the usual exaggeration which artists without the nautical instinct or training almost invariably display, but the saddest feature is that such a splendid piece of work should be handicapped by such a ridiculous name.

It is a little difficult for those who dwell by the salt water to realize that the biggest thing of her type is to be found on the great lakes, but we are gradually becoming accustomed to surprises from that section. I am,

Very truly yours,
17 Battery place, Brine.
New York, Nov. 20, 1912.

October Ore Receipts

Ore shipments during October were 7,010,219 tons, of which 5,913,493 tons went to Lake Erie ports, distributed as follows:

Port.	October, 1912.
Buffalo	906 541
Erie	177,685
Conneaut	1,056 775
Ashtabula	1,234.953
Fairport	278,231
Cleveland	1,221,572
Lorain	622 790
Huron	76,177
Sandusky	......
Toledo	287,511
Detroit	51,258
Total	5,913,493

Lake Erie Ore Receipts

Ore shipments during November were 4,072,674 tons, and during December, 14,579 tons, of which total, 3,811,530 tons went to Lake Erie ports, distributed as follows:

Port.	Nov., 1912.
Buffalo	630,011
Erie	103.429
Conneaut	574,056
Ashtabula	799,848
Fairport	138,957
Cleveland	800,022
Lorain	263,054
Huron	58 215
Sandusky	......
Toledo	242,167
Detroit	67,441
Total	3,677,200

Port.	Dec., 1912.
Buffalo	20 486
Cleveland	79,926
Ashtabula	22 829
Lorain	4,634
Toledo	6,455
Total	134,330

Accidents to Lake Vessels

Nineteen Vessels Became Total Losses on the Great Lakes During 1912—The List

DURING 1912 a number of vessels ended their existence on the great lakes, nineteen vessels being either total losses or constructive total losses. The most important loss was that of the steamer James Gayley, which was sunk in collision with the steamer Rensselaer on Lake Superior, the combined loss of ship and cargo being about $300,000.

The first total loss of the season was that of the tug Charles A. Trinter, which was totally destroyed by fire at Vermilion on April 25. The Canadian steamer Iona, coal laden, took fire on Lake Ontario on May 20, and burned to the water's edge, the crew escaping in life boats. The little steamer Joseph C. Suit was accidentally hit by the steamer City of Detroit III while making dock and was sunk. The Canadian steamer Bothnia was sunk in St. Clair river in collision with the steamer S. S. Curry on June 26, being practically cut in two when the Curry sheered into her through a disabled rudder. The steamer Sydney C. McLouth was destroyed by fire on Green Bay on June 28. The steamer Viking ran ashore at Split Rock, Lake Superior, and was abandoned to the underwriters. The steamer Columbia, of Niagara Falls was badly damaged by fire on July 5 at Ogdensburg, becoming a total loss.

The great activity that was exhibited in lake trade during the year caused a number of old craft to be placed in commission that were certainly not safe carriers of iron ore in heavy weather. One of these, the Culligan, formerly the George T. Hope, foundered on Lake Superior while carrying an ore cargo. The steamer S. K. Martin sprang a leak off Harbor Creek, Lake Erie, on Oct. 12, the crew reaching shore in the yawl boat. The fishing tug Carrie E. foundered in Lake Huron during a heavy gale on Oct. 11, the crew, however, managing to escape. The barge Marengo was also pounded to pieces off Morgan's Point, Lake Erie, in this storm.

Most Singular Accident

The Canadian steamer Keystorm met with a most singular accident, running ashore on Scow Island, St. Lawrence river, and two hours later sliding off the rocks and sinking in 400 ft. of water. On Nov. 1 the barge Locke, in tow of the steamer Juneau, sank in Lake Ontario near Port Hope. The old steamer Russell Sage was destroyed by fire on Nov. 2, while at dock. On Nov. 6 the barge Hattie Wells was swamped by heavy seas on Lake Michigan and lost. On Nov. 21 the steamer South Shore ran ashore near Point Sable, Lake Superior, during a heavy gale and was pounded to pieces. The schooner Rouse Simmons appears to have foundered in the gale on Lake Michigan on Dec. 4 with her crew of 16 hands. While the revenue, cutter Tuscarora has searched the lake for her no trace of the vessel has been found.

The total losses are summarized as follows:

Vessel.	Carrying capacity, gross tons.
Tug Charles A. Trinter	....
Steamer Iona	500
Steamer Joseph C. Suit	1,350
Steamer Bothnia	1,650
Steamer Sidney C. McLouth	3,000
Steamer Viking	2,000
Steamer Columbia	2,200
Steamer James Gayley	7,500
Steamer Culligan	2,800
Steamer S. K. Martin	500
Tug Carrie E.	....
Barge Marengo	1,200
Steamer Pine Lake	700
Steamer Keystorm	3,000
Barge Locke	600
Steamer Russell Sage	1,800
Barge Hattie Wells	400
Steamer South Shore	....
Schooner Rouse Simmons	500

Were it not for the foundering of the schooner Rouse Simmons with the drowning of her crew of 16, the losses of life would not have been heavy. Five men lost their lives in the explosion on Standard Oil Barge No. 88 lying in Cuyahoga river at Cleveland. Two lives were lost by the bursting of steam pipes in the engine room of the steamer James Davidson on Lake Superior. One life was lost in the sinking of the steamer Pine Lake near Belle Isle on Oct. 21, and a sailor on the steamer Fleetwood was washed overboard while the vessel was rolling in the trough of the sea on Lake Huron. Four members of the crew of the tug Freeds were drowned as a result of being hit by the steamer Harvey D. Goulder which she was towing at the time. Four lives were also lost on the schooner Three Sisters which became waterlogged in Green bay, making a total of 33 lives.

An analysis of the more important accidents develops the fact that nearly all of them could have been avoided by the careful observance of the rules of navigation. It must be admitted, bers of the crew of the tug Freeds however, that the Great Lakes Protective Association has done a great deal to minimize this form of accident. Some of the losses were quite heavy, notably the steamer G. J. Grammer, which was sunk in collision with the steamer Northern Queen near Corsica Shoal, Lake Huron, on July 14, spending three weeks in dry dock in Cleveland after she was released. The steamer G. Watson French collided with the steamer Mataafa on Grosse Point, Lake St. Clair, on July 27, damaging the Mataafa very badly.

Following is a tabulation of accidents since Aug. 1. The list of accidents prior to that time will be found in the August MARINE REVIEW.

Date—Name of Vessel.	Nature of accident.	Location.
Aug. 2 Str. Bransford	Grounded while coming in to land some passengers; released on Aug. 3; not damaged	Mackinaw City.
Aug. 2 Str. W. M. Egan	Carried away four gates of lock 23; punctured hole in her side and broke wheel	Welland canal.
Aug. 3 Str. W. H. Truesdale	Stuck in mud and when released very suddenly crashed into bridge, moving it 10 ft. out of place. Upper part of steamer damaged	Blackwell canal, Buffalo.
.... Str. C. F. Curtis	Machinery became disabled; anchored her consorts and went back to Port Huron	Lake Huron.
Aug. 3 Str. Kensington	Hit steamer J. J. Boland; stem bent and port side damaged	Superior, Wis.
Aug. 3 Str. J. J. Boland	Hit by steamer Kensington; two plates damaged on starboard side abreast of cabin	Superior, Wis.
Aug. 7 Str. James Gayley	Collided with steamer Rensselaer and sank; total loss; crew and passengers rescued by steamer Stadacona; loss estimated at $300,000	Lake Superior.
Aug. 7 Str. Rensselaer	Collided with steamer James Gayley; bow stove in and forepeak filled with water; put into Marquette for temporary repairs and left on Aug. 10 for Cleveland where she was docked on Aug. 14; about 20 plates removed; repairs completed Aug. 24	Lake Superior.

Aug. 9	Sch. Romeo	Filled with water as she was about to start on trip and settled on bottom in shallow water	Sandusky, O.
Aug. 9	Str. H. S. Sill	Ran ashore in dense fog; released on Aug. 10 after lightering 600 tons of coal; reloaded lightered cargo; docked at Milwaukee; 46 plates damaged and heavy internal damage; three weeks out of commission	Nine Mile Point, Lake Huron.
Aug. 9	Str. B. F. Jones	Backed into a coal dock and damaged her rudder; delayed until Aug. 14 making repairs	Outer harbor, Cleveland, O.
Aug. 10	Str. Filbert	Ran ashore in dense fog; released by steamer Collingwood, uninjured	St. Mary's River.
Aug. 10	Str. Wisconsin	Ran aground; released, uninjured	Buffalo breakwater.
Aug. 16	Str. H. E. Packer	Collided with the hold gates of Lock 24; new gates installed	Welland canal.
....	Str. J. G. Munro	Struck coming down; No. 1 starboard tank leaked; docked at Lorain on Aug. 17; 15 damaged plates; nine days making repairs	Sault river.
....	Str. Abraham Stearn	Hit pier; temporarily repaired	Gary, Ind.
....	Str. Malietoa	Picked up a log and damaged her wheel and rudder; repaired at Lorain	Lake Huron.
Aug. 17	Str. Leafield	Stranded on rocks; released on Aug. 28 and taken to Collingwood; docked; 20 plates damaged, 16 of which must be replaced; also will get new stem	Lonely Island, near Midland.
Aug. 18	Str. A. E. Stewart	Ran ashore in heavy weather; released on Aug. 20 after lightering 26,000 bushels of cargo; docked at Cleveland; 3 plates damaged; repairs completed Aug. 27	Sturgeon Point, Lake Erie.
Aug. 18	Tug Robert H. Hebard	Hit by steamer Edwin F. Holmes; fender strake ripped off about 4 ft. and hull somewhat damaged	Buffalo.
Aug. 18	Str. John W. Moore	Caught up long wire cable which jammed between stern bearing and hub of wheel with such force as to stop her engine, causing her to run aground	Sarnia, St. Clair river.
....	Str. C. A. Congdon	Struck; docked at Superior Aug. 20; 90 plates taken off and about 50 frames damaged; ten days to make repairs	Lake Michigan.
Aug. 21	Derrick scow	Struck a pile and sank to the bottom	Lorain.
Aug. 21	Sand Str. Perry	Sank in 15 ft. of water when a temporary patch over a hole gave way	Black Rock harbor, Buffalo.
Aug. 22	Str. W. P. Snyder	Ran on rocky bottom right after leaving Canadian locks; released after lightering 300 tons; docked at Ashtabula; 14 plates and number of frames damaged	Sault Ste. Marie.
Aug. 26	Str. Tionesta	Ran ashore in dense fog; released on Aug. 27 after lightering; reloaded lightered cargo	Tin Shoals, Straits of Mackinac.
Aug. 26	Str. Peter Reiss	Ran ashore in thick weather; released herself, uninjured	Poe's Reef, Straits of Mackinac.
Aug. 27	Bge. Holland and Bge. Fassett	Tow line parted between barges and steamer Cherokee; causing them to strand; released, uninjured	Entrance to Harbor Beach.
Aug. 28	Drill Boat No. 1	Collided with Str. St. Paul; badly damaged; docked for repairs	Entrance to Buffalo harbor.
Aug. 28	Bge. Donaldson	Sprang a leak and was beached under east breakwater	Cleveland, O.
Aug. 30	Str. Brandon	Parted wheel chain just outside of harbor and was towed into port	Buffalo harbor.
Sep. 1	Str. Wm. H. Rogers	Crossed tow line of oil tug Security and her barge in dense fog, causing barge to crash into starboard bow of Rogers; barge's anchors punched through her plates, stern twisted and port bow badly damaged; damage extended from forefoot to forecastle deck and from stem to collision bulkhead; returned to Sault for survey and then went to Superior to be docked; about three weeks' time for making repairs	Near Whitefish Point, Lake Superior.
Sep. 1	Oil tug Security	Collided with steamer Wm. H. Rogers; stern badly twisted and 13 plates damaged; docked at Cleveland Sept. 5	Near Whitefish Point, Lake Superior.
Sep. 2	Str. Clifford Moll	Jammed between lock walls and steamer Venezuela; 70 ft. of top facing of lock wall torn up	Poe locks.
Sep. 3	Str. J. K. Dimmick	Stuck in channel owing to strong current; released on Sept. 4, uninjured	Cleveland.
....	Str. Walter Scranton	Ran aground; lightered and released on Sept. 5	Georgian Bay.
Sep. 5	Str. Thos. Shaughnessy	Damaged her steering gear and rudder coming down the river	Cleveland.
Sep. 6	Str. Minnie R.	Burned to water's edge; cause unknown; loss estimated at $10,000	Holland, Mich.
....	Str. Britannic	Ran ashore; after two weeks of effort to release her abandoned by wreckers Sept. 7	St. Lawrence River, near Morrisburg.
Sep. 7	Str. Simon Langell	Foremast carried away by B. & O. bridge	Cleveland.
Sep. 9	Tug Lycora	Water pouring in through her dead-lights forward caused her to sink to the bottom	Cleveland.
Sep. 9	Ferry Ste. Claire	Ran aground in fog; released by a tug on Sept. 11	Peche Island.
Sep. 12	Str. Wilbert L. Smith	Ran aground in fog; released on Sept. 14 after lightering 1,000 tons of ore; leaked; docked at Toledo on Sept. 18; about three weeks to make repairs	Mission Point, Mackinac Island.
Sep. 12	Str. Amazonas	Collided with her barge Matanzas; collision caused by suction of passing steamer (Paipoonge); towing engine dragged out, tearing up most of her deck aft and damaging number of deck beams; both Matanzas and Amazonas went to Detroit for repairs	Lake St. Clair.
Sep. 14	Str. Faustin	Sank at Delray Salt Co.'s dock	————
Sep. 16	Str. Frank Heffelfinger	Hit N. Y., P. & O. dock, damaging it slightly; steamer not injured	Cleveland, O.
Sep. 16	Str. F. B. Squire	In backing out of slip, stern hit opposite bank and had to be towed back to elevator, as she blocked channel; lost two days on account of accident	Chicago, Ill.
Sep. 17	Str. Norway	Struck an obstruction; after stopping for an examination proceeded on her trip	Detroit River.
....	Str. A. McVittie	Struck a crib; damaged her forefoot and bow	Morrisburg.
Sep. 17	Str. J. C. Gilchrist	Ran aground in thick weather; released on Sept. 22 after lightering 45,000 bu. of grain; reloaded lightered cargo; not damaged.	Stag Island, St. Clair River.
Sep. 17	Str. Nottingham	Ran aground in thick weather; released on Sept. 20 after lightering about 1,000 tons of ore; not injured; reloaded lightered cargo	Stag Island, St. Clair River.
Sep. 19	Str. Harvard	Ran aground near ore dock, owing to low water; released herself	Huron, O.
....	Str. Christopher	Hit a dock; was not damaged	Chicago, Ill.
Sep. 22	Str. Alva C. Dinkey	Lost quadrant and ran aground on Recor's Point; released on Sept. 24 and waited at St. Clair for new quadrant, shipped from Cleveland on Sept. 24	St. Clair River.
Sep. 23	Str. Nevada	Broke four gates in a lock; steamer somewhat damaged	Lachine canal.
Sep. 24	Str. Thomas Shaughnessy	Ran aground in harbor; released on Sept. 25 after lightering 1,000 tons of ore	Toledo, O.
Sep. 24	Str. George W. Peavey	Damaged her shoe and rudder; docked at Superior on Sept. 26	Duluth, Minn.

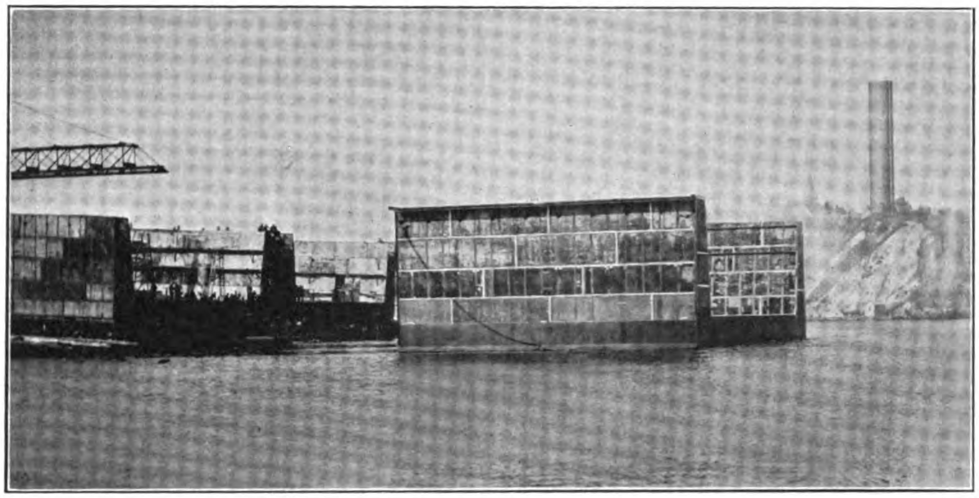
Sep. 25	Sch. Newell Hubbard	Sprang a leak and sank in 21 ft. of water; probably total loss	Lake Erie, near Bois Blanc Island.
Sep. 25	Bge. Montezuma	Sprang a leak in storm and was towed into Portage Lake by her steamer (Amazonas); lost her spars and was otherwise damaged; to be repaired at Houghton	Off Eagle Harbor, Lake Superior.
Sep. 25	Str. Amazon	Collided with steamer Angeline; not damaged	Lake St. Clair.
Sep. 25	Str. Angeline	Collided with steamer Amazon; not damaged	Lake St. Clair.
....	Str. Van Vleck	Struck and damaged her rudder; picked up in disabled condition at Detour and towed to Cleveland by a tug; ran ashore on Kelley's Island Sept. 30, enroute to Cleveland	Soo River.
Sep. 27	Str. Culligan	Foundered; steamer not insured	Lake Superior.
....	Str. Wilkesbarre	Steering gear disabled	Near Waugoshance, Straits of Mackinac.
Oct. 1	Str. W. B. Dickson	Hit abutment of a bridge and damaged four plates and eight frames; repaired at ship yard	Lorain, O.
....	Str. Polynesia	Lost all buckets off her wheel; towed by a Canadian steamer to Alpena; left Milwaukee Oct. 9 after making repairs	Lake Huron.
Oct. 5	Str. John J. Barlum	Collided with steamer Champlain in fog; settled on bottom in shallow water; temporarily repaired at Marine City; docked at Cleveland on Oct. 8; eleven plates taken off and a number of frames damaged; repairs completed Oct. 19	St. Clair River, near Algonac.
Oct. 5	Str. Champlain	Collided with steamer John J. Barlum in fog; stem badly damaged and lost her starboard anchor, but proceeded on her way; unloaded at Buffalo and left for Ashtabula, where she was docked on Oct. 8; stem badly twisted and 14 bow plates damaged	St. Clair River, near Algonac.
Oct. 5	Str. D. Z. Norton	Struck an obstruction in dense fog, puncturing compartments No. 1, 2 and 3, and settled on bottom; released on Oct. 8; left for South Chicago on Oct. 11, where she was docked; starboard side ripped open for about 280 ft.; 48 plates damaged, 21 of which must be replaced; narrow escape from foundering in deep water. Repairs completed Nov. 2	Lake Michigan, near Sleeping Bear Point.
Oct. 6	Str. Onoko	Collided with steamer Stadacona, being hit by Stadacona's wheel; after getting out into open lake she sprang a leak and was beached at Ironwood island, of the Apostle group; released on Oct. 8 and put into Ashland for temporary repairs; sailed on Oct. 8 for Buffalo where she unloaded 21,000 bu. wet grain; docked at Lorain on Oct. 21	Duluth Harbor.
....	Str. F. L. Robbins	Crowded out of channel by another steamer and hit a lumber dock; not damaged	Sarnia, Ont.
Oct. 8	Str. Cadillac	Struck a projection in canal wall and went to bottom; small hole in starboard side and seams opened; pumped out and floated on Oct. 9; docked at Ashtabula on Oct. 16; eight plates taken off	Welland canal.
Oct. 11	Bge. Imperial	Turned turtle and sank in 30 ft. of water; shifting of cargo of stone thought to have caused accident	Off Vote Island, Lake Superior.
Oct. 11	Str. W. P. Rend	Ran ashore in storm; released on Oct. 12 and proceeded	Near Fox Point, Lake Michigan
Oct. 11	Fish Tug Carrie E	Foundered in heavy gale; crew rescued	Lake Huron.
Oct. 12	Str. S. K. Martin	Sprang a leak in storm and sank; crew reached shore in yawl boat; total loss	Off Harbor Creek, Lake Erie.
Oct. 12	Str. Picton	Ran ashore in fog and storm; released herself, uninjured	Morgan's Point, Lake Erie.
Oct. 12	Bge. Marengo	Ran ashore in fog and storm; tugs could not release her and she pounded to pieces; total loss	Morgan's Point, Lake Erie.
....	Str. Geo. W. Perkins	Ran ashore in storm on rocks; floated on Oct. 16 after lightering about 3,500 tons of ore; docked at Lorain; 35 or 40 plates taken off and about 100 frames damaged; bulkhead damaged and she will get new stem	Mission Point, Mackinac Island.
Oct. 12	Str. Rensselaer	Stranded on west bank in gale; released on Oct. 15 after lightering 1,000 tons of coal; reloaded lightered cargo	Ballard's Reef, Detroit river.
Oct. 12	Str. Fleetwood	Collided with steamer Normania; big hole punctured in her bow at water line; patched up at Buffalo and left port	Buffalo harbor.
Oct. 13	Str. Thos. Maytham	Ran ashore in storm on rock bottom; released on Oct. 15 after being pumped out and left for Cleveland, where she was docked on Oct. 20; 90 plates will have to come off and tank top is damaged; will take at least 30 days to make repairs	Crab Island Reef, near Detour.
Oct. 14	Str. Benjamin Noble	Struck; leaked but proceeded; docked at Superior on Oct. 20; 54 plates damaged; will lose about 3 weeks	Near Detour.
....	Str. E. C. Pope	Hit by tremendous wave and arrived at Manitowoc on Oct. 14 badly damaged, with bow bulwarks broken to bits	————
Oct. 15	Str. Petoskey	Damaged Anchor Line dock; boat not damaged	Chicago.
Oct. 17	Str. Sinaloa	Ran aground owing to disabled steering gear; released on Oct. 18	Hay Lake.
Oct. 16	Str. Sheldon Parks	Hit by steamer J. Donaldson; few top plates damaged	Sault.
....	Str. Jay C. Morse	Lost her starboard anchor and 45 fathoms of chain	Whitefish Bay.
Oct. 17	Str. Scottish Hero	Broke her piston rod	Sault.
Oct. 17	Tug Edward C	Collided with tug George T. Nelles near Lake Shore bridge; the Edward C. damaged above water line	Cleveland.
....	Str. Harvester	Hit approach to Canadian lock and damaged one plate and two frames	Sault.
Oct. 19	Bge. B. L. Pennington	Sank in 20 ft. of water while being used as a lighter to float steamer Amazonas	Niagara river.
Oct. 20	Str. Collingwood	Hit by schooner Middlesex; slightly damaged	Port Colborne.
Oct. 20	Str. Lake Shore	Ran aground in fog while trying to pass another boat; released on Oct. 20; reloaded lightered cargo and left for Cleveland	Off Russell Island, St. Clair river.
Oct. 21	Str. Pine Lake	Collided with steamer Fleetwood owing to misunderstanding of signals; Pine Lake sank; wreck will be dynamited	Lake St. Clair, near Belle Isle.
Oct. 23	Sch. Christiana	Waterlogged; lost rigging and deck load of lumber; crew taken off and schooner towed into Marinette harbor by tug	Off Green Island, Lake Mich.
Oct. 23	Str. Fleetwood	Wheel chains parted and she drifted in trough of sea; returned to Port Huron for repairs; rolled so hard that one member of crew was thrown overboard and drowned	Off Point Aux Barques, Lake Huron.
....	Str. J. J. Boland	Grounded at entrance to harbor; released, uninjured	Buffalo.
....	Str. W. B. Davock	Grounded at entrance to harbor; released, uninjured	Buffalo.
....	Str. Sonoma	Grounded at entrance to harbor; released, uninjured	Buffalo.
Oct. 26	Str. Keystorm	Ran ashore on Scow Island; badly damaged and filled with water; in two hours slid off rocks and sank; total loss	St. Lawrence river.
Oct. 26	Str. Denmark	Lost bucket off her wheel; new wheel put on at Port Huron and she proceeded	Detroit river.

....	Str. Amazonas	Released on Oct. 30, after having been aground nearly two weeks	Niagara river.
Oct. 28	Str. J. J. H. Brown	Lost her rudder; docked at Superior Oct. 30	Off Duluth, Lake Superior.
Oct. 29	Bge. F. A. Georger	Broke away from steamer Easton in storm; crew went ashore in yawl boats; anchored near Port Colborne	Lake Erie, near Port Colborne.
Oct. 31	Str. Calgary	Ran aground at north entrance; lightered 150 tons pulpwood; released on Nov. 1, uninjured	Buffalo harbor.
Oct. 31	Str. Colonel	Hit obstruction near No. 2 coal dock, knocking a blade off her wheel	Lorain.
Nov. 1	Str. Samuel Marshall	Lock No. 13 carried away by steamer and bridge near dock knocked into canal	Welland canal.
Nov. 1	Str. W. P. Palmer	Hit east pier and damaged five plates; will make temporary repairs and finish season	Lorain.
Nov. 1	Str. Juneau	Sprang a leak and put back to Cobourg, where she sank at pier	Lake Ontario, near Port Hope.
Nov. 1	Bge. Locke	In tow of steamer Juneau when she sprang a leak; cut loose; anchor failing to hold fast; she sank; crew reached shore after perilous trip	Lake Ontario, near Port Hope.
Nov. 2	Str. Russell Sage	Destroyed by fire while at her dock, laden with lumber; not insured; total loss	————
....	Str. Port Colborne	Struck; examined at Tonawanda	St. Lawrence river.
....	Str. George B. Leonard	Ran aground; released herself Nov. 7, uninjured	Sand Point, Lake Michigan.
Nov. 6	Bge. Hattie Wells	Swamped by heavy seas in storm and lost; crew rescued; barge and cargo (lumber) valued at $6,000	Lake Michigan.
....	Str. Seneca	Sank a scow; two plates damaged on steamer	Chicago.
Nov. 8	Bge. Chattanooga	Pounded pretty hard in gale; sprang a leak and lost her rudder; (in tow of steamer Frontenac); towed into port by tugs; docked at Cleveland Nov. 15	Off Cleveland harbor, Lake Erie
Nov. 8	Str. Harlow	Ran aground; released on Nov. 9, uninjured	St. Clair river, near St. Clair.
....	Str. Uranus	Ran aground; released herself	Hay Lake.
Nov. 8	Bge. Alex. Maitland	Ran aground while coming out of Erie; released on Nov. 12 after lightering about 600 tons of coal cargo; reloaded lightered cargo and sailed in tow of steamer Fitch	South Bank, near Erie.
Nov. 9	Str. Alaska	Broke her piston rod off cylinder head and damaged other parts of her machinery; towed to Soo for repairs	Hay Lake.
Nov. 10	Tug Wm. A. Freeds	Hit by steamer Harvey D. Goulder while towing her out and rolled over, drowning four of her crew	Indiana Harbor.
Nov. 10	Str. J. F. Durston	Collided with steamer J. C. Gilchrist; did not stop	Detroit river.
Nov. 10	Str. J. C. Gilchrist	Collided with steamer J. F. Durston; did not stop	Detroit river.
Nov. 11	Str. Rosedale	Ran ashore in storm; released on Nov. 12 and taken to Detour; arrived at Soo on Nov. 14, leaking badly; temporarily repaired and reloaded lightered cargo; left Soo for Port Arthur on Nov. 18, where she will be docked	Lighthouse Point, near Detour.
Nov. 11	Str. J. C. Wallace	Hit an obstruction, knocking some of buckets off her wheel; rudder spindle broken	South Chicago.
Nov. 12	Str. W. H. Mack	Crank disabled and was obliged to return to Duluth for repairs	Lake Superior.
Nov. 12	Str. Rochester	Grounded in storm; released herself on Nov. 13 and proceeded, uninjured	Whitefish Pt., Lake Superior.
Nov. 12	Str. Delos W. Cooke	Ran ashore in fog; released herself; bottom badly damaged; repairs estimated at $20,000	Lake Michigan, near Milwaukee
Nov. 13	Str. F. B. Squire	Grounded in storm; floated on Nov. 16 after lightering	Toledo, O.
....	Str. J. L. Weeks	Ran aground in storm; not damaged; left Soo on Nov. 18 after reloading lightered cargo	Upper St. Mary's River.
....	Str. L. L. Barth	Lost her deck load of 100,000 ft. of lumber in gale	Lake Superior.
....	Str. Nipigon	Put in at Soo Nov. 14 leaking badly	————
....	Str. Western Star	Struck; not damaged	Calcite, Mich.
....	Str. G. Watson French	Grounded in harbor owing to low water caused by storm; released herself on Nov. 14	Toledo, O.
Nov. 14	Tug Excelsior	Pilot-house smashed in during storm; put back into Cleveland	Lake Erie.
....	Str. City of Mackinac II	Damaged in violent snow storm	Lake Huron.
Nov. 14	Str. Tuscarora	Lost her rudder in storm and rolled badly in trough of sea; picked up by steamer John Albright and towed to Port Huron; cargo transferred to steamer Wilkesbarre and Tuscarora left Port Huron on Nov. 23 in tow of steamer Mauch Chunk for Buffalo	Near Thunder Bay Island.
....	Str. Collingwood	Gounded; released on Nov. 15	Abreast of Sarnia.
....	Str. Clyde	Arrived at Duluth on Nov. 14 with loose stern bearing after storm; docked at Superior on Nov. 15	————
....	Str. Ward Ames	Struck a rock and damaged two plates	Livingstone Channel.
Nov. 17	Str. Averill	Lost her rudder; picked up by steamer Robert Wallace and towed to Cheboygan, leaving there on Nov. 27 for Buffalo for repairs	Near Mackinaw City.
Nov. 18	Str. Harvey D. Goulder	Crashed into canal wall; hole torn in her bow; six plates on starboard bow above water line damaged; three days for temporary repairs	Sault canal.
Nov. 18	Str. Milinokett	Struck end of Great Northern flour dock while entering slip in fog, considerably damaging it; misunderstanding of signals caused accident; boat not damaged	Superior, Wis.
....	Str. E. L. Wallace	Struck in approaching channel, damaging No. 1 and 2 tanks and ten plates; docked at Toledo Nov. 21; about one week to make repairs	Livingstone channel.
....	Str. Charles A. Weston	Struck	Buffalo harbor.
Nov. 19	Str. Sacramento	Lost her rudder; stopped at Port Huron where another was installed; left on Nov. 23 for Chicago	Near Port Huron.
....	Str. D. W. Mills	Arrived at Duluth on Nov. 19 disabled and was docked at Superior; shoe broken	Lake Superior.
....	Str. Choctaw	Ran aground; released on Nov. 22 after lightering about 500 tons of her cargo	Toledo, O.
Nov. 21	Str. Uganda	Broke her tiller while shifting; repaired at Superior ship yard	Great Northern Slip, Superior.
....	Str. Keybell	Broke her high pressure cylinder and was towed to Cape Vincent	Lake Ontario.
....	Str. South Shore	Ran ashore during violent wind storm; pounded to pieces; total loss	Near Sable Pt., Lake Superior.
....	Str. Turret Crown	Reached the Soo on Nov. 25 with broken steering gear	————
Nov. 24	Sailboat Three Sisters	Became waterlogged; four lives lost	Green bay.
Nov. 26	Str. Crete	Ran aground while coming out of Fort William; released on Nov. 28 after lightering part of cargo; reloaded lightered cargo and sailed on Nov. 28; not damaged	Fort William.
....	Str. Arthur Orr	Damaged her rudder	————
Nov. 28	Str. Northwind	Plate on port bow dented and number of rivets loosened up by striking freight dock; temporarily repaired	Duluth.

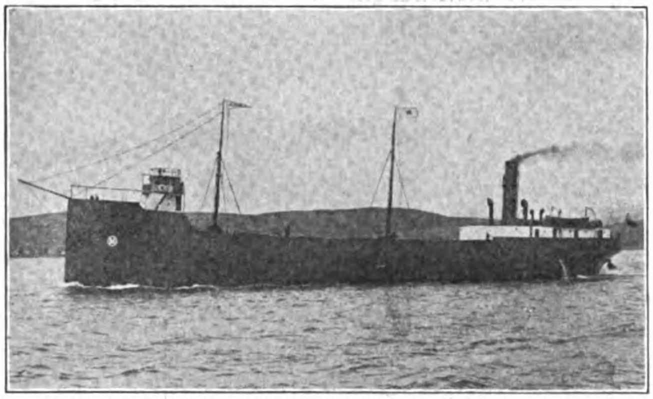
Eng. lib.

THE MARINE REVIEW

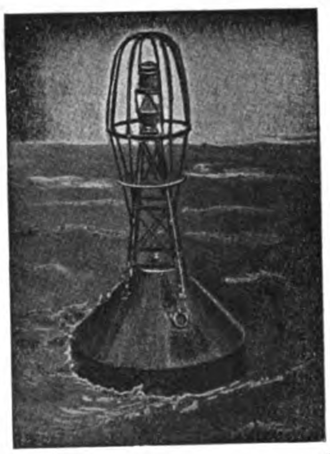
VOL. 42 CLEVELAND DECEMBER, 1912 NEW YORK No. 12



Launching One Section of the Large Floating Dry Dock



S. S. "ACADIAN" for WELLAND CANAL TRADE



NEVASPLIT PANELS

TRADE MARK—REGISTERED

LIGHT — RIGID
WATERPROOF
STRONG

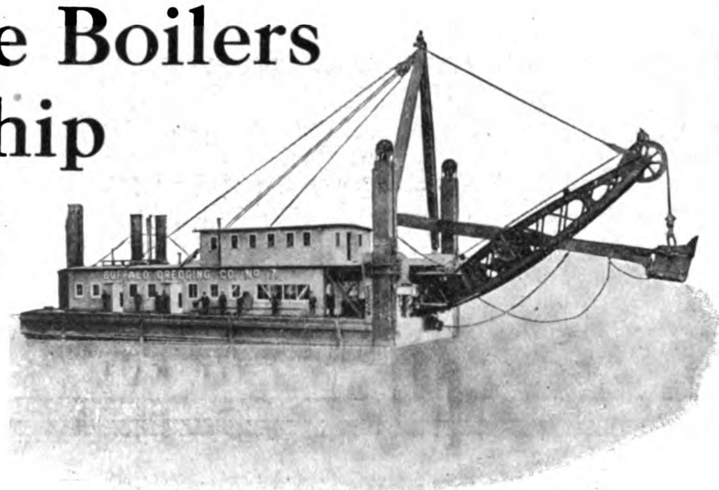
The choice for the largest and most luxurious River Steamboat ever built.

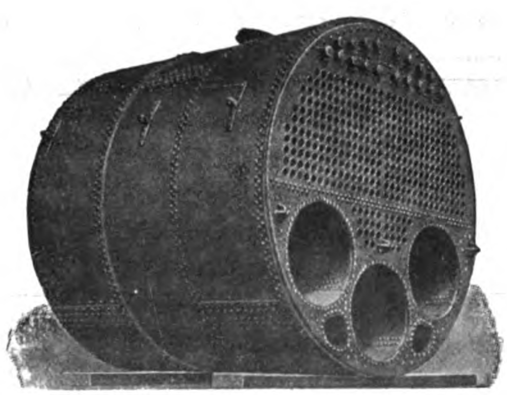
For saloon bulkheads, door panels, stateroom walls, and ceilings between decks of the Nevasplit was chosen against all other panel materials after careful consideration and comparative tests based on shop experiment and actual service in other ships.

KEYES PRODUCTS CO.
71 West 23rd St., NEW YORK, N. Y.

Under Construction by C. M. Englis, Brooklyn, N. Y.

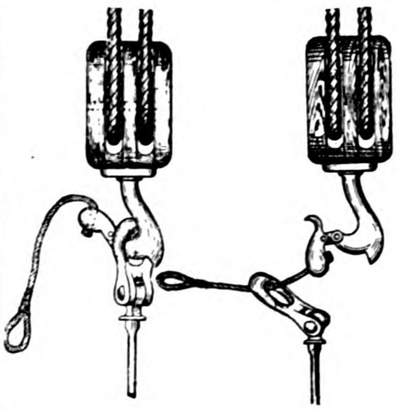
Modern Marine Boilers and Steel Ship Building





Tugs, Passenger Steamers and Special Construction

Write **JOHNSTON BROTHERS**
FERRYSBURG, MICHIGAN



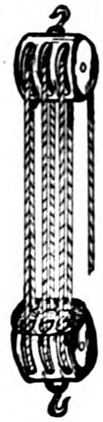
RAYMOND

Releasing Hook

Extremely simple. Quick, safe and ***reliably automatic***---thus enabling crew to get boat away quickly. Hooks will not release until boat becomes waterborne, eliminating all danger of inopportune release. This device not only releases the boat, but it can be hooked on in a bad sea or on a dark night without injury to the hands of those hooking on. This important feature is possessed by no other device. Hooks, if desired, will be sent to the block maker and shackles to the boat builder.

"Star" Non-Toppling Block Device

Absolutely prevents capsizing and fouling, keeps the blocks clear and in vertical position in readiness for quickly hooking on—remaining so until boat is hoisted inboard. Made of galvanized iron. Fits your old blocks. Send for prices.



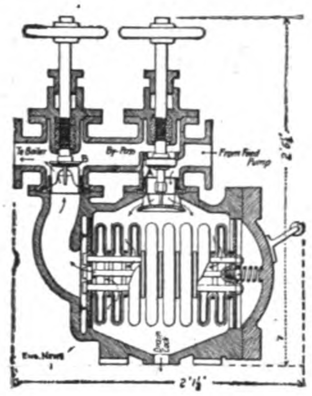
JAMES R. RAYMOND
No. 8 BRIDGE ST., NEW YORK
Geo. B. Carpenter & Co., Chicago, Ill., Sales Agents for the Great Lakes Section

Mechanical Telegraphs and Engine Bells

Electric Lights
Bells and Fire
Alarm Systems

Manufactured by

CHAS. CORY & SON
286 Spring St., near Hudson
NEW YORK CITY



OUR

Feed-Water Filters

will keep oil out of your boiler.

They Have No Equal

Write for list of users.

Ross Valve Mfg. Co., Troy, N. Y.

STRATFORD OAKUM

QUALITY GUARANTEED

JERSEY CITY and EVERYWHERE

GEO. STRATFORD OAKUM CO., 165 Cornelison Ave., Jersey City, U. S. A.

WHERE TO BUY

AGENTS.
(Vessel and Freight.)

Boland & Cornelius 97
Hawgood & Co., W. A. 97
Hutchinson & Co. 97
McCarthy, T. R. 97
Richardson, W. C. 97
Vance & Joys Co. 97

ANCHORS.

American Engineering Co. 2
Bowers & Co., L. M. 17

APPARATUS.—(Steering.)

American Ship Building Co. 5
Chase Machine Co. 12
Dake Engine Co. 13
Detroit Ship Building Co. 5
Hyde Windlass Co. 100
Sheriffs Mfg. Co. 91

APPARATUS.—(Submarine Diving.)

Morse & Son, A. J. 85
Schrader's Son, Inc., A. 85

ARCHITECTS.—(Naval.)

Babcock & Penton 96
Curr, Robert 96
Furstenau, M. C. 96
Kidd, Joseph & Son, Duluth, Minn. 96
Hynd, Alexander 96
Watts, J. Murray 97

ARMORS.—(Submarine.)

Morse & Son, A. J. 85
Schrader's Son, Inc., A. 85

ASBESTOS PRODUCTS.

Johns-Manville Co., H. W. 19

ATTORNEYS AND PROCTORS IN ADMIRALTY.

Gilchrist, Albert J. 96
Goulder, Day, White, Garry & Duncan.. 96
Holding, Masten, Duncan & Leckie 96
Hoyt, Dustin, Kelley, McKeehan & Andrews 96
Kremer, C. E. 96
Shaw, Warren, Cady & Oakes 96

BARS—(Iron or Steel—Hollow Staybolt)

Falls Hollow Staybolt Co. 83

BEACONS.

Safety Car Heating & Lighting Co. 10

BELLS.—(Engine Room, Telegraph, Call, Etc.)

Cory & Sons, Chas. 18
National Tube Co. 15

BINNACLES.

Ritchie, E. S., & Sons 90

BLOCKS.—(Tackle.)

Boston & Lockport Block Co. 91

BOATS.—(Builders.)

Drein, Thomas, & Son 97
Kahnweiler's Sons, David 99

BOOKS.

Penton Publishing Co., The ....

BOILERS.—(Marine.)

Almy Water Tube Boiler Co. 83
American Ship Building Co. 5
Babcock & Wilcox Co. 429
Bath Iron Works 11
Chicago Ship Building Co. 6
Clyde Shipbuiding & Engrg Co. 10
Commercial Boiler Works 83
Delancy, P., & Co. 83
Detroit Ship Building Co. 5
Fletcher, W. A., & Co. 12
Great Lakes Engrg. Works 22
Johnston Bros. 11
Kingsford Fdy. & Mach. Works 83
Manitowoc Ship Bldg. & Dry Dock Co... 9
Milwaukee Dry Dock Co. 7
Mosher Water Tube Boiler Coo. 429
Seattle Const. & Dry Dock Co. 8
Superior Ship Building Co. 6
Toledo Ship Building Co. 4

BRASS GOODS.

Penberthy Injector Co. 100

BUOYS, BOATS, PRESERVERS, ETC. (Life.)

Drein & Son, Thos. 97
Kahnweiler's Sons, David 99

BUOYS.—(Gas.)

Safety Car Heating & Lighting Co. 10

BUOYS.—(Spar.)

Safety Car Heating & Lighting Co. 10

BUSHINGS.—(Adjustable.)

Armstrong Mfg. Co. 99

WHERE TO BUY

FURNACES.—(For Boilers.)

Continental Iron Works 2

GAGES.—(Steam.)

Ashton Valve Co 15

GAGES.—(Water.)

Penberthy Injector Co 100

GASKETS.

Johns-Manville Co., H. W 19

GEARS.—(Steering.)

Akers Steering Gear Co .... —
American Engineering Co 2
American Ship Building Co 5
Chase Machine Co 12
Dake Engine Co 13
Detroit Ship Building Co 5
Hyde Windlass Co 100
Sheriffs Mfg. Co 91
Standard Chain Co 16

GENERATORS.

General Electric Co 21

GRAPHITE.

Dixon Crucible Co., Joseph 100
Johns-Manville Co., H. W 19

GRAPHITE.—(Lubricating.)

Dixon Crucible Co., Joseph 100

GYPSEYS.—(Steam.)

American Engineering Co 2

HAMMERS.—(Steam.)

Chase Machine Co 12
Griscom-Russell Co. 99

HEATERS AND PURIFIERS.—(Feed-Water.)

Griscom-Russell Co. 99
Ross Valve Mfg. Co 12

HOISTERS.—(Ferrall's Cargo.)

Boston & Lockport Block Co 91

HOISTS.—(Air.)

Great Lakes Engrg. Works 22

HOISTS.—(Cargo, Etc.)

American Engineering Co 2
American Ship Building Co 5
Boston & Lockport Block Co 91
Chase Machine Co 11
Dake Engine Co 13
General Electric Co 21
Hyde Windlass Co 100

HOISTS.—(Chain.)

Dake Engine Co 13

HOISTS.—(Electric.)

American Engineering Co 2
General Electric Co 21
Lidgerwood Mfg. Co 85

HOISTS.—(Pneumatic.)

Dake Engine Co 13

INDICATORS.

Electro Dynamic Co 97

INJECTORS.

Penberthy Injector Co 100

INSTRUMENTS.—(Nautical.)

Nicholson Ship Log Co 84
Ritchie, E. S., & Sons 99
Schuette Recording Compass Co 84

INSULATION.—(Asbestos and Electrical.)

Johns-Manville Co., H. W 19

INSURANCE.—(Marine.)

Boland & Cornelius 97
Hawgood, W. A., & Co 97
Hutchinson & Co 97
McCarthy, T. R 97
Richardson, W. C., & Co 97
Vance & Joys Co 97
Willcox, Peck & Hughes 86
Young & Co., Wm. H 97

IRON.—(Pig.)

Hanna & Co., M. A 82
Pickands, Mather & Co 82

JACKETS.—(Cork.)

Kahnweiler's Sons, David 99

JOINTS.—(Expansion.)

National Tube Co 15

LAMPS.—(Arc.)

General Electric Co 21

LANTERNS.—(Buoy.)

Safety Car Heating & Lighting Co 10

LAUNCHES.

Drein, Thos., & Son 97

LIFE PRESERVERS.

Justus Brauer & Son 97

LIGHTS.—(Electric.)

Cory & Son, Chas 18
General Electric Co 21

LINSEED OIL.

Patterson-Sargent Co. 81

LOGS.

Nicholson Ship Log Co 84
Schuette Recording Compass Co 84
Walker & Sons, Thomas 3

LUBRICATORS.

Penberthy Injector Co 100

LUMBER.

Martin-Barriss Co. 19

MACHINERY.—(Coal and Ore Handling.)

Bartlett, C. O., & Snow Co 91

MACHINERY.—(Dredging.)

American Engineering Co 2
Chase Machine Co 12
Great Lakes Engrg. Works 22
Superior Iron Works 81

MACHINERY.—(Marine.)

American Ship Building Co 5
Chase Machine Co 12
Chicago Ship Building Co 6
Clyde Ship Building Co 10
Collingwood Ship Building Co 8
Dake Engine Co 13
Detroit Ship Building Co 5
Fletcher Co., W. & A 12
Fore River Ship Building Co 97
Great Lakes Engineering Works 22
Johnston Bros. 11
Manitowoc Ship Bldg. & Dry Dock Co 9
Sheriffs Mfg. Co 91
Superior Iron Works 81
Superior Ship Building Co 6
Toledo Ship Building Co ....

MACHINERY.—(Refrigerating.)

Great Lakes Engineering Works 22
Roelker, H. B. 14

MACHINES.—(Towing.)

American Engineering Co 2
Chase Machine Co 12

MACHINISTS.

Chase Machine Co 12
Superior Iron Works 81

MOTORS—(Electric.)

Electro Dynamic Co 97
General Electric Co 21

NOZZLES.—(For Fire Hose.)

Morse & Son, A. J 85

OAKUM.

Davy, W. O., & Sons 429
Stratford Oakum Co., Geo 18

OILS AND LUBRICANTS.

Dixon Crucible Co., Joseph 100

ORE.—(Iron.)

Hanna & Co., M. A 82
Pickands, Mather & Co 82

PACKING.

Home Rubber Co 14
Johns-Manville Co., H. W 19
Katzenstein, L., & Co 14

PACKING.—(Metallic.)

Johns-Manville Co., H. W 19
Katzenstein, L., & Co 14
Metallic Packing & Mfg. Co 85

PACKING.—(Sheet Rubber.)

Johns-Manville Co., H. W 19

PACKING.—(Spiral and Coil—Steam.)

Johns-Manville Co., H. W 19

PAINT.—(Marine.)

Patterson-Sargent Co. 81

PANELS.

Keyes Products Co 11

PANEL WOOD.

Keyes Products Co 11

PATENTS.

Siggers & Siggers 97

PIPE.

National Tube Co 15

PIPE COVERING.

Johns-Manville Co., H. W 19

PIPE THREADERS.

Toledo Pipe Threading Machine Co 87

PLANTS.

(Ice Making.)

Roelker, H. B. 14

PLATES AND SHAPES.

(Ship and Boiler.)

Otis Steel Co., Ltd 19

PRESERVERS.

(Life, Life Boats, Buoy, Etc.)

Drein, Thos., & Son 97
Kahnweiler's, David, Sons 99

PROJECTORS.—(Electric.)

General Electric Co 21

PUMPS AND APPLIANCES.

(Air.)

Great Lakes Engineering Works 22
Kingsford Fdy. & Machine Co 83

PUMPS.

(For Various Purposes.)

Great Lakes Engineering Works 22
Kingsford Fdy. & Machine Co 83
Roelker, H. B. 14

RADIATORS.

National Tube Co 15

REGULATORS.

(Pressure.)

Ross Valve Mfg. Co 12

WHERE TO BUY

REPAIRS.
(Marine.)

American Ship Building Co. 5
Buffalo Dry Dock Co. 7
Chicago Ship Building Co. 6
Clyde Ship Building & Engrg. Co. 10
Collingwood Ship Building Co. 8
Delaney, P., & Co. 83
Detroit Ship Building Co. 5
Fore River Ship Building Co. 97
Goldschmidt Thermit Co. 429
Great Lakes Engineering Works 22
Griscom-Russell Co. 99
Johnston Bros. 11
Manitowoc Ship Bldg. & Dry Dock Co. .. 9
Michigan Salt Works 100
Milwaukee Dry Dock Co. 7
St. Lawrence Marine Ry. Co. 85
Sheriffs Mfg. Co. 91
Superior Ship Building Co. 6
Tietjen & Lang Dry Dock Co. 12
Toledo Ship Building Co. 4

RINGS.
(Cork.)

Kahnweiler's Sons, David 99

RIVETS.
(Steel for Ships and Boilers.)

Great Lakes Engineering Works 22

ROPE.

Columbian Rope Co. 81
Durable Wire Rope Co. 16
Wall Rope Works of New York 16

ROPE AND FITTINGS.
(Wire.)

American Steel & Wire Co. 17
Durable Wire Rope Co. 16

SCOWS.
(Fueling.)

Bartlett, C. O., & Snow Co. 91

SEARCH LIGHTS.

General Electric Co. 21

SETS.
(Marine Electric.)

General Electric Co. 21

SHAPES AND PLATES.
(Ship and Boiler.)

Otis Steel Co., Ltd. 19

SHEAVES.

Boston & Lockport Block Co. 91

SHIP BUILDING SYSTEM.

Isherwood, J. W. 3

SHIPS.
(Builders.)

American Ship Building Co. 5
Bath Iron Works 11
Buffalo Dry Dock Co. 7
Chicago Ship Building Co. 6
Clyde Ship Building & Engrg. Co. 10
Collingwood Ship Building Co. 8
Detroit Ship Building Co. 5
Fletcher Co., W. & A. 12
Fore River Ship Building Co. 97
Great Lakes Engineering Works 22
Isherwood, J. W. 3
Johnston Bros. 11
Manitowoc Ship Building & Dry Dock Co. 9
Milwaukee Dry Dock Co. 7
Seattle Const. & Dry Dock Co. 8
Superior Ship Building Co. 6
Tietjen & Lang Dry Dock Co. 12
Toledo Ship Building Co. 4

SPECIALTIES.
(Steam.)

Griscom-Russell Co. 99
Hynd, Alexander 96
Penberthy Injector Co. 100
Ross Valve Mfg. Co. 12

STAYBOLTS.
(Boiler—Iron or Steel, Hollow or Solid.)

Falls Hollow Staybolt Co. 83

STEAMSHIP LINES.
(Passenger and Freight.)

American Line 87
International Mercantile Marine Co. 87

STOCKS.

Armstrong Mfg. Co. 99

STOKERS.

American Engineering Co. 2
Babcock & Wilcox Co. 429

STOPPERS.
(Boiler-Tube.)

Griscom-Russell Co. 99

STOPPERS.
(Chain.)

American Engineering Co. 2

STOPS.—(Engine Safety.)

Metallic Packing & Mfg. Co. 85

SUPERHEATERS.
(Marine.)

Babcock & Wilcox Co. 429

SUPPLIES AND SPECIALTIES.
(Engineers'.)

Griscom-Russell Co. 99
National Tube Co. 15
Penberthy Injector Co. 100
Ross Valve Mfg. Co. 12

SUPPLIES.
(Fire Department.)

Morse & Son, Inc., Andrew 85
Hynd, Alexander 96

SUPPLIES.
(Marine.)

Griscom-Russell Co. 99

SURVEYORS.
(Marine.)

Babcock & Penton 96
Curr, Robert 96
Furstenau, M. C. 96
Hunt & Co., Robert W. 96
Hynd, Alexander 96
Kidd, Joseph, & Son......Duluth, Minn. 96

SWITCHBOARDS.

General Electric Co. 21

TANKS.

Bath Iron Works 11
National Tube Co. 15

TESTS OF MATERIALS.

Babcock & Penton 96
Curr, Robert 96
Furstenau, M. C. 96
Hunt & Co., Robert W. 96
Hynd, Alexander 96
Kidd, Joseph, & Son......Duluth, Minn. 96

THERMIT.

Goldschmidt Thermit Co. 429

TIMBER.
(Ship.)

Martin-Barriss Co. 19

TRAPS.
(Steam.)

National Tube Co. 15

TUBES.

National Tube Co. 15

TUBING.
(Seamless.)

National Tube Co. 15

TUGS.

Bath Iron Works 11

TURBINES.

Bath Iron Works 11
Fletcher, W. A., & Co. 12
Fore River Ship Building Co. 97

TWINE AND YARN.
(Tarred Sisal.)

Columbian Rope Co. 81
Wall Rope Works 16

UNIONS.

National Tube Co. 15

VALVES.

Homestead Valve Mfg. Co. ....Front cover
Hynd, Alexander 96
National Tube Co. 15
Penberthy Injector Co. 100
Ross Valve Mfg. Co. 12

VALVES.
(For Water and Gas.)

Ashton Valve Co. 15
National Tube Co. 15
Ross Valve Mfg. Co. 18
Star Brass Mfg. Co. 14

VENTILATORS.
(Ship.)

Schutte & Koerting Co. 99

VESSELS FOR SALE.
(Steam.)

Boland & Cornelius 97
McCarthy, T. R. 97
Richardson, W. C., & Co. 97

WELDING.

Great Lakes Welding Co. 84
Michigan Salt Works 100
National Welding Co. 84

WELDING.
(Flue.)

Fix's, S., Sons 91
Great Lakes Welding Co. 84
Michigan Salt Works 100

WELDING PROCESSES.

Goldschmidt Thermit Co. 429

WHEELS.
(Propeller.)

American Ship Building Co. 5
Case & Son, A. Wells 91
Detroit Ship Building Co. 5
Fore River Ship Building Co. 97
Great Lakes Engineering Works 22
Hyde Windlass Co. 100
Milwaukee Dry Dock Co. 7
Roelker, H. B. 14
Sheriffs Mfg. Co. 91
Superior Ship Building Co. 6
Toledo Ship Building Co. 4
Trout, H. G. 91

WINCHES.

American Engineering Co. 2
Chase Machine Co. 12
Hyde Windlass Co. 100
Lidgerwood Mfg. Co. 85

WINDLASSES.

American Engineering Co. 2
American Ship Building Co. 5
Dake Engine Co. 13
Hyde Windlass Co. 100

WIRE.

American Steel & Wire Co. 17

WOODS.
(Cabin and Cabinet Finishing.)

Martin-Barriss Co. 19

WORK.
(Submarine.)

Dunbar & Sullivan Dredging Co. 92
Great Lakes Dredge & Dock Co. 431
Starke Dredge & Dock Co., C. H. 92
Sullivan, M. 93

YACHTS.
(Builders.)

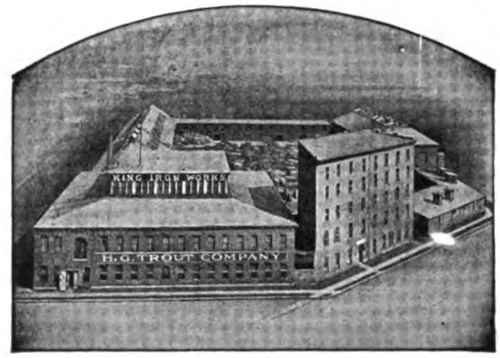
Bath Iron Works 11

YAWLS.

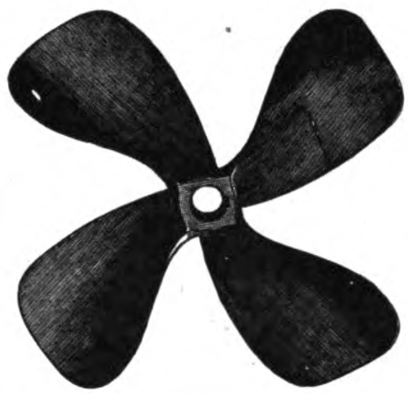
Drein, Thos., & Son 97
Manitowoc Ship Bldg. & Dry Dock Co. .. 9

H. G. TROUT COMPANY

King Iron Works
Buffalo, N. Y.



Manufacturers of High Grade
Speed Boat Wheels



¶ All sizes, sectional and solid, in Iron, Steel, Semi-Steel and Bronze.

¶ We also make Steam and Gas Engines, marine and stationary. Brass and Iron Castings.

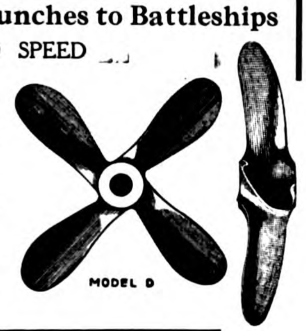
Write for particulars and testimonials

CASE OUTWARD THRUST PROPELLER WHEELS

For Any Vessels, from Launches to Battleships

GREATEST POWER AND SPEED
LEAST VIBRATION

The most powerful and smoothest running Propeller on the market.
The Maximum of Efficiency.
Write for Catalog



A. WELLS CASE & SON
HIGHLAND PARK, CONN.

ESTABLISHED, 1854.

SHERIFFS MANUFACTURING CO.

Manufacturers of
PROPELLER WHEELS
Marine Engines and Repairs.

Milwaukee, Wis.
Phone S. 163

FUELING SCOWS AND COAL HANDLING MACHINERY

THE C. O. BARTLETT & SNOW CO.
CLEVELAND, O., U. S. A.

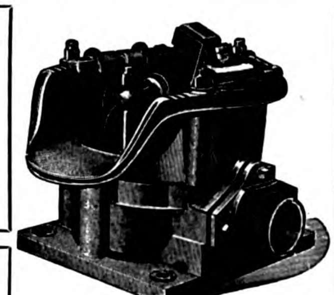
Oram Fix ESTABLISHED 1860 J. W. Fix

S. FIX'S SONS

Successors to S. Fix & Son

Steam Flue Welding Works

Our work stands government test. Our Welds are perfectly smooth.
Write us for prices.
Cor. Leonard and Winter Sts. CLEVELAND, OHIO



No. 1811.

MANUFACTURERS OF
★ **STAR BRAND BLOCKS** ★
Special Blocks of all styles for all kinds of heavy work
STRONGEST BLOCKS MADE

BLOCKS AND PUMPS
for all kinds of Marine Work
Send for Catalogue M. R.

PUMPS FOR MARINE CONTRACTORS, Sewer Departments, Water Works and Railroads.

BOSTON & LOCKPORT BLOCK CO.
124 Condor Street, EAST BOSTON, MASS.

To Get Results

If you want to buy or sell anything marine,

If you want to find a good marine position,

If you want to find competent help for the industry,

Or in short---The man who wants anything marine, just naturally puts his ad in the Classified Advertisement pages of the *Marine Review*.

Here's the usual result

Duluth, Minn., July 17, 1912

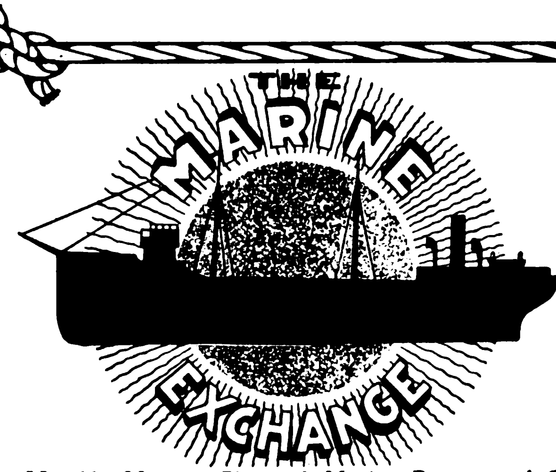
Marine Review,
Cleveland, Ohio

Dear Sirs —

I have sold the Tug Constitution to R. P. Thompson, Port Huron, Mich., through my one ad in the *Marine Review*.

Thank you ever so much.

Yours truly,
James Magee



"The Monthly Meeting Place of Marine Buyers and Sellers"

Rates and Rules

Liner Advertisements under headings "For Sale," "Marine Wants," etc., ONLY TWO CENTS PER WORD, the address counts as eight words

One inch space, single column, $1.00

No advertisement will be published for less than 50 cents. Cash must accompany order, as the amounts are too small to permit of opening accounts.

Advertisements must reach this office before the first of any month, if they are to appear in that month's issue

Send Your Advertisement Now

For Sale

FOR SALE—Lumber and coal tow. Steamer and two barges. Capacity each boat about 900 tons coal, 550,000 feet lumber, class 80. Will sell very reasonable.

MR. J. U. KARR
1330 West 11th St., CLEVELAND, O.

FOR SALE CHEAP

One Williamson Bros. Combined hand and steam steerer with stand and valve operating levers. Size of cylinders 7" x 7". In perfect condition. Price $300.00 cash. Cost price $1200.00. Address

JERRY McCARTHY & SONS
157 Ohio Street Buffalo, N. Y.

FOR SALE

One Marine Fire Box Boiler 4' 6" x 7' built for 130 pounds.
One Scotch Type Boiler 72" x 8' built for 150 pounds.
One Wheeler Surface Condenser for 1000 H. P.

Address MERTES MACHINERY CO.
Milwaukee, Wis.

FOR SALE OR WILL TRADE

for small passenger boat. Tug with full outfit of gill nets, pond nets and hooks.

Inquire W. P. Robertson
Mackinaw City, Mich.

For Sale
STEAMER OGONTZ

90 ft. overall, 17 ft. beam. Will sell at a bargain. Address

Chas. W. Triggs Co.
Chicago, Ill.

Steamer Toltec Carries 750 M. Feet Lumber

Rates 90. Barge Jeremiah Godfrey carries 850 M. feet lumber. Rates 85. Full information write

Grace Harbor Lumber Co.
Detroit, Mich.

For Sale

FOR SALE CHEAP. CANADIAN REGistered passenger Steamer. 200 gross tons. Rating 90. New Scotch boiler. Hull in good repair. Can be seen at Sandusky. Address Capt. J. W. Post, Chatham, Ont., or Sandusky, Ohio.

FOR SALE VERY REASONABLE, barge in good condition. Well equipped class 80. Address Box 42, THE MARINE REVIEW, Cleveland, O.

THE PASSENGER STEAMER WILLOW, built 1903, oak hull, 80 feet over all. 16 feet beam, 3½ feet deep. Twin screw. Two six, squares, speed about 9 miles per hour. Scotch boiler, allowed 150 lbs. steam, inspected July 1, 1912. Electric lights all around. Boat and equipment in first class shape. Address Capt. P. H. Riley, 311 Parade St., Erie, Pa.

FOR SALE—TWO SCHOONER BARGES. Capacity each boat 550 M. ft. lumber, 900 tons coal. Class 80. Might exchange for real estate. Address Box 41, THE MARINE REVIEW, Cleveland, O.

PASSENGER LAUNCH 40 X 10 X 3 FT. 4 in., allowed and equipped for 60 passengers. Gull planked with 1¼ oak. Engine 16 horsepower, 2-cylinder Kahlenberg motor. Speed 8 miles per hour, is a good sea boat. Address Box 44, THE MARINE REVIEW, Cleveland, O.

FOR SALE:—FINE SAND AND GRAVel steamer, full equipped with complete electric light plant and unloading derrick, speed 11 miles, sand capacity 465 cubic yards. For further particulars address Box 40, THE MARINE REVIEW, Cleveland, O.

FOR SALE

A STEAMER OF 600 tons carrying capacity in excellent condition and of good earning capacity. For terms inquire of

H. C. BRADLEY 212 The Arcade
Cleveland, Ohio

For Sale

FOR SALE CHEAP: — ONE 110-VOLT dynamo, also one powerful search light. Write to Eliza J. Ludwig, Watervliet, Mich. R. F. D. No. 1.

FOR SALE

The small passenger and freight steamer Massapequa.

Martin Wagner Company
Baltimore, Md.

Marine Wants

I WANT TO HEAR FROM SOME good, substantial engine manufacturer who wishes to place on the market one of the most valuable improved engines. Silent, positive valve action with no springs. This is not a freak and was invented by a man with fourteen years practical experience in this line who knows what can and what cannot be done with iron and steel and who knows what will and what will not sell. Address Box 37, THE MARINE REVIEW, Cleveland, O.

WHAT IS OFFERED FOR A 50 H. P. Standard Fairbanks engine passenger and freight boat, carries from 100 to 150 passengers. In first class condition. For particulars write to Julius Minck, 34 Belvidere St., Brooklyn, N. Y.

WANTED: — A SMALL BOAT SUITable for a sand-sucker, capacity from 300 to 500 tons. Must be in good condition. Address X. Y. Z., THE MARINE REVIEW, Cleveland, O.

WANTED, A STEAMBOAT. SHOULD have a capacity of between 150 and 200 passengers and storage room for a couple of automobiles. The speed is to be about 10 to 12 miles an hour and it is to make about three or four mile run each trip. Address Box 43, THE MARINE REVIEW, Cleveland, O.

WOODEN SHIP YARD TOOLS AND MACHINERY

For Sale

Consists of saw and jig mill, planer, blacksmith and tools of all description. In order to close up an estate this property will be sold at a sacrifice. For particulars

Address Box 39

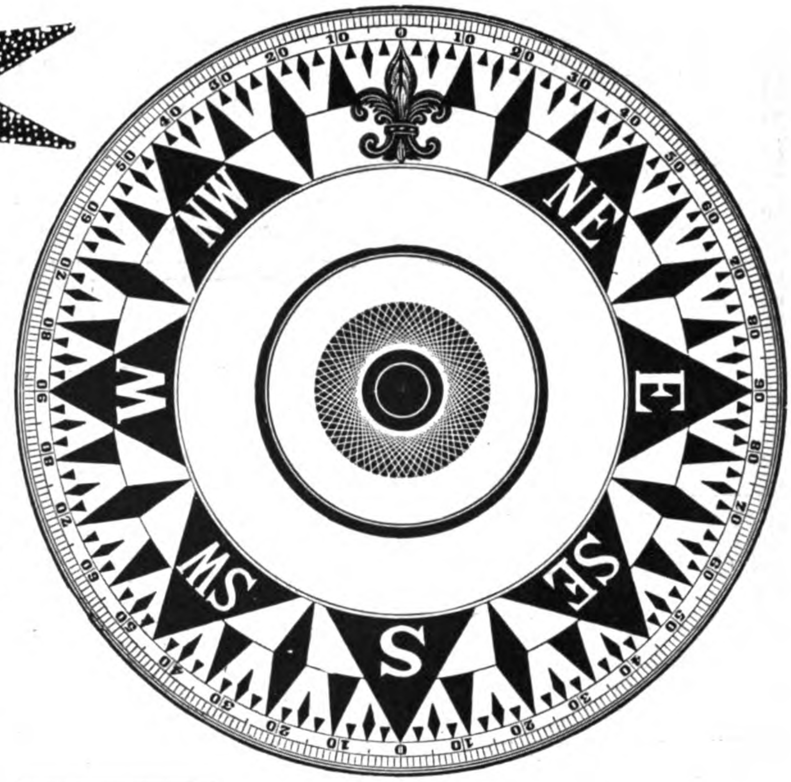
THE MARINE REVIEW, Cleveland, O.

THE PROPER COURSE TO TAKE

if you have marine wants of any kind whatever, is *NOT* to wait for chance to put you in touch with the right man or men in the marine field, but just place a small advertisement stating your wants under the classified columns of

The Marine Exchange

Fill Out the Blank and Give It a Trial



Why Wait Until Spring to Sell Your Boat, Engine, Boiler, Etc.

Disposing of it now will SAVE STORAGE COST and give you the use of the READY CASH.

Any marine equipment you might have on hand is bound to DEPRECIATE IN VALUE until Spring.

Why keep your money tied up when a small ad in the
Annual Shipbuilding Number
will turn anything marine which you might wish to sell into READY CASH, RIGHT NOW

OVER FIVE THOUSAND MARINE PEOPLE WILL READ THIS BIG ISSUE. SURELY OUT OF THIS NUMBER A BUYER WILL BE FOUND FOR YOUR BOAT, BOILER, ENGINE OR OTHER EQUIPMENT

THE COST—Only Two Cents Per Word, or $1.00 Per Inch

FILL OUT, TEAR OFF HERE AND MAIL BACK TO US

WRITE OUT YOUR AD HERE

I enclose herewith $............ { currency / money order / stamps } to cover cost of above ad which please run until forbid. I understand marked copies are to be mailed me showing my ad.

Name____________________

Address____________________

Index to Advertisements

